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# Is evolution truly random? Chance as an ideological weapon in the 'evolution-creation' debate

*The theory of evolution by natural selection has been debated by scientists and theologians of all faiths since it was first published by Charles Darwin in 1859. One of the core issues is the extent of chance's role in the evolutionary process and the consequences of random evolution on the classical understanding of the cosmos as a reality created by divine design and guided by a divine providence: if evolution is completely random, what place is left for God's hand? This crucial question has been given a wide array of diverging answers, ranging from the non-existence of evolution to the non-existence of God via several attempts to combine chance and design in a universal theory. This essay discusses the underlying concepts of chance and design displayed by three key movements in today's debate: scientific creationism – that evolution as a completely random process is antithetic to a providential faith; Intelligent Design – that the current theory of evolution is found lacking and must be completed by a divine design and designer; and scientific materialism – that evolution as a partially random but completely mindless process renders providence and design obsolete.*

**Key words:** chance, design, providence, evolutionary theory, creationism, Richard Dawkins, Daniel Dennett, Intelligent Design Theory, William Dembski, Michael Behe

## Introduction

When first published in 1859, Darwin's theory of evolution by means of natural selection received a mixed welcome. Although the idea of evolution had already been discussed for a few decades among scholars, natural selection could indeed have been considered a completely autonomous process, henceforth radically downplaying, even nullifying, God's role in the history of the universe and of mankind. Among the issues at stake lies the extent of chance in the evolutionary process and its potential incompatibility with the concept of divine providence, with the crucial consequence of turning the question into an either/or choice – chance or design, science or religion. Various positions have emerged over time, either setting at odds scientific and theological conceptions – and choosing one over the other – or trying to combine both in a new perspective on the world. This argument is at least partly due to misunderstandings of the meanings of 'chance' and 'design' in biological and theological frameworks – a situation we will endeavour to rectify in this essay by focusing on the conceptions of

three key ideological movements at opposite ends of today's debate: scientific creationism, Intelligent Design theory (ID) and scientific materialism.

Let us begin by briefly examining the multiple meanings of 'chance' in biology and 'design' in theology.

The commonest use of 'chance' refers to an unexpected, unplanned turn of events – best rendered 'luck' or 'coincidence'. This is also the oldest usage, proposed by Aristotle in the fourth century BC in the second book of his *Physics*. 'Lucky' events are not deprived of finality, but occur in the course of events conceived with another aim in mind. Their outcome is – in Aristotle's and today's conception – always good or bad (*Physics* II, 5, 15). 'Coincidence', on the other hand, is devoid of any implication of this sort. Aristotle's conception was revived in the nineteenth century by French mathematician Antoine Augustin Cournot.[1] His theory considers that every occurrence is determined by a series of successive causes and that the universe is full of these independent causal chains. A chance occurrence – an accident – is then defined as the intersection (or co-occurrence, or coincidence) of two or more independent causal chains – a definition that can be likened to Aristotle's, although set in a purely causal background.[2]

Cournot's perspective on chance led him to propose a philosophical and mathematical understanding of the relationships between these fortuitous events that has vastly influenced the development of two fields where randomness is of importance in biology (and in other domains) – probability and chaos theories, which deal with the ability to predict events from laws deduced from initial conditions and repeated observations.[3] The latter theory focuses on scientific (or deterministic) chaos, which refers to the high degree of unpredictability of the so-called chaotic systems due to their utmost sensitivity to their initial condition (a consequence best known as 'the butterfly effect'). They are too complex to be integrated with the precision required for accurate modelling – a sensitivity that may sometimes give the impression that these conditions were purposely combined (or designed) to reach a predetermined outcome.[4] The former theory – probability – characterises what arises from Cournot's theory of chance occurrences, when the same independent series occurs multiple times.

1 Sentis, P. 'La notion de hasard: ses différentes définitions et leurs utilisations', *Laval théologique et philosophique* (2005) 61(3), 487-488 ; Cournot, A-A. in *Complete Dictionary of Scientific Biography* (2008), http://www.encyclopedia.com/topic/Antoine_Augustin_Cournot.aspx.

2 Maldamé, J-M. 'Hasard et providence', *Laval théologique et philosophique* (2005) 61(3), 542.

3 Gayon, J. 'Evolution et hasard', 529; Lambert, D. 'Le déterminisme du hasard: quelques exemples tirés de la théorie des graphes et des paysages'; Sentis *op. cit*., (1), 476-478, all in *Laval théologique et philosophique* (2005) 61(3).

4 Lejeune, D. *The Radical Use of Chance in 20th Century Art*, Amsterdam: Rodopi (2012), pp. 19-21, 39-41; Sentis *op. cit*., (1), 481.

This repetition can give rise to theoretical models and make randomness somewhat predictable – chance does not equate to disorder, as Cournot had already argued. Statistical randomness implies that even if the exact result of a process is unknown, it is part of a definite ensemble of possible outcomes – hence its predictability. Random events are therefore always part of a series; a truly unique event cannot be referred to as random, but as accidental. Furthermore, the very predictability of random events itself implies that 'chance' can only yield certain results. At least in a scientific context, chance is always linked to a certain level of order – it can but influence the choice between the various possibilities offered by that order.[5] Pure chance does not exist – it is always determined to some extent by the structure within which it occurs.

On the other hand, the theological notion of 'design' is encompassed within the larger concept of divine action in the world – namely creation and providence.[6] The current comprehension of 'creation' is twofold, referring both to the making of the universe by God and to his continuous involvement in his world to maintain it. Creation, hence, occurs both at the beginning (*creatio in principio*) and over time (*creatio continua*). The second aspect of divine action – providence – corresponds to how God governs his creation towards his ends.[7] God is 'viewed as a personal ruler of both individual and universal history, … who aims ultimately at salvation. Providence is not just foresight, nor is it merely passive "seeing" or "knowing". It thinks of God's overall relation to the world as one of active caring.'[8] The extent and manner of divine interventions in history have been heatedly debated over centuries, notably regarding their compatibility with human decisional autonomy and hence moral responsibility. The intricate relationships between divine providence and predestination – in other words, the degree to which one's actions equate to one's own salvation in a pretemporally foreordained universe – have been in the spotlight of Catholic and Protestant discussions since the sixteenth century. This is an issue to which the current chance/design debate bears a striking resemblance. That God has a salvific plan – design – for this world and specifically for mankind is beyond doubt for theologians of all sides, but how far that design goes is still open to discussion.

5 Delsol, M. 'Le hasard dans la nature et son "sel" *épistémologique* dans les phylogenèses de l'évolution biologique', *Laval théologique et philosophique* (2005) 61(3), 433-434.

6 Bourgine, B. 'Le miracle dans la théologie fondamentale classique', *Recherches de Science Religieuse* (2010) 8, 507 ; Kehl, M. *'Et Dieu vit que cela était bon'*: *Une théologie de la création*, Paris: Cerf (2008), pp. 26-33.

7 Auletta, G. 'Providence', in Lacoste, J-Y. (ed.) *Dictionnaire critique de théologie*, Paris: PUF (2007), p. 1145.

8 Bernhardt, R. 'Providence', in Fahlbusch, E., et al. (eds.) *The Encyclopedia of Christianity*, vol. 4, Leiden: Brill (2005), p. 403.

## Scientific creationism

Although creationism originally equates to the belief in the fact that our universe was created by God (or by gods), it commonly refers today to a stricter ideology based on a literal understanding of Scripture, which therefore rejects the very idea of evolution as opposed to the account of divine creation as explained in Genesis. Interestingly, this was not the case at Darwin's time, as geological data about the age of the Earth and 'higher' criticism from archaeological findings had already led most scholars to dismiss such a literal reading. As a matter of fact, the issue lay not so much with evolution per se as with the novel concept of natural selection. When the *Origin of Species* was published, evolution was indeed by no means a recent idea, and had been more or less grudgingly accepted by most theologians as a possible means of divine creation.[9] On the other hand, natural selection was new – and it formed the heart of Darwin's book, as indicated by its full title: *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*. The diversity of species was henceforth explainable without the help of any external agency, effectively rendering God superfluous.

Even though such an assumption was not made even by Darwin himself at the time, a significant proportion of scholars of his time eagerly adopted it. Among them was Reverend Charles Hodge, an influential Presbyterian theologian from Princeton Theological Seminary.[10] In his book *What is Darwinism?*, published in 1874, Hodge defined the three main components he saw in Darwinian theory – evolution, natural selection, and natural selection without design. Only the last one is attributed to Darwin himself, but it states exactly the criticism of Darwin made by Hodge – that he offers an intellectual system that could stand on its own without God, or without any kind of purpose at all. The theologian considered this 'Darwinist' evolution to be entirely ruled by chance and thus completely incompatible with a God-driven process. Atheistic in essence, Darwinism had therefore to be fought tooth and nail, for it posed a threat to the whole Christian faith.[11] Furthermore, Hodge attacked Darwin for stepping outside scientific boundaries: in his mind, design, which characterised all living things, could not logically be generated by chance, and hence pretending otherwise was unscientific – an obvious leap of faith. Although their literalist premises largely differ from Hodge's, creationists still advance both arguments today.

9 Barbour, I. *Religion and Science*: *Historical and Contemporary Issues*, London: SCM (1998), p. 82.

10 Gregory, F. 'The impact of Darwinian evolution on Protestant theology in the nineteenth century', in Lindberg, D. & Numbers,R. (eds.) *God and Nature: Historical Essays on the Encounter between Christianity and Science*, Berkeley: University of California Press (1986), p. 375-377.

11 'Religion has to fight for its life against a large class of scientific men', quoted in Gregory *op. cit.* (10), p. 385.

Anti-evolutionism had never been of great concern to the self-proclaimed fundamentalists until the 1920s (Darwinism is only briefly mentioned in *The Fundamentals*, which were published between 1910 and 1915), when they began seeing Darwinism as the major source of unbelief among American youth and of social degeneration in general, as was epitomised in the Scopes trial (or 'monkey trial') in 1925.[12] Although opposed to evolution for religious reasons, fundamentalists – creationists – based their battle on scientific grounds. They claimed that evolutionary theory was no true science, but an interpretation of facts, a mere hypothesis, against which their own scientific explanations stood stronger. The said explanations were, of course, true to the Genesis account of creation. However, although it was their common tenet, creationists, far from presenting a united front against Darwinism, diverged in their actual interpretation of this account, primarily as regards the days of creation and the number of creations.

The place left for evolution differed greatly in each understanding, although none was ever given to natural selection. As it is impossible to assess all creationist ideologies, we will focus on one of them, the strictest and probably most widespread of all – Young Earth Creationism (YEC). YEC was revived in the 1960s, mainly through the creation by the Seventh-Day Adventist Church of a Geoscience Research Institute dedicated to training qualified creationist biologists and geologists, and of the Institute for Creation Research (ICR) by Henry Morris, who dubbed the resurgent movement 'scientific creationism'. The positions defended by the ICR go beyond evolution and touch upon every scientific discipline concerned with the origin of Earth and of mankind; they can be summarised as follows:

> Sudden creation of the universe, energy and life from nothing; insufficiency of mutation and natural selection in bringing about development of all living kinds from a single organism; changes only within fixed limits or originally created kinds of plants and animals; separate ancestry for man and apes; explanation of the Earth's geology by Catastrophism, including the occurrence of a worldwide Flood; a relatively recent inception of the Earth and living kinds.[13]

These elements characterise creation science from its beginning to its current form.[14] Among those expressly dedicated to evolution, the argument of the logical impossibility of chance as enunciated by Hodge clearly stands apart. It is intricately interwoven with the rejection of evolution

12 See Numbers, R. 'The creationists', in Lindberg & Numbers *op. cit.*, (10), pp. 391- 403.

13 These form a 1981 Arkansas statute concerning the teaching of creationism and evolution at school, quoted in Grant, J. *Discarded Science*: *Ideas that Seemed Good at the Time*, London: Facts, Figures and Fun (2006), p. 179.

14 See also Ruse, M. 'Scientific creationism', in Ruse, M. (ed.), *But is it Science? The philosophical question in the creation/evolution controversy*, Buffalo: Prometheus (1988), pp. 257-265; Roth, A. *Origins: Linking Science and Scripture,* Hagerstown*:* Review and Herald Publishing (1998) for more complete explanations.

as science, which is central to the claim that creation science should be taught in biology classes along with (or instead of) evolution:

> Few Christians realize the extent to which the evolutionary world-view conflicts with the Biblical world-view. … Christianity and evolution cannot both be true. Evolution is, at its very essence, an atheistic explanation of the world around us. …
>
> But evolution is not a fact! Evolution is not even in a category of things that could ever be a scientific fact! It is a world-view about the past – an historical reconstruction. It is a way to interpret scientific data, such as rocks, fossils, and complex living systems which exist in the present.[15]

Evolution is regarded as incompatible with Christianity because its process is wholly driven by chance, including natural selection. That particular standpoint is in direct opposition to evolutionary theory, in which, although mutations can be labelled random, natural selection definitely cannot, as we shall see in the penultimate section below. The ICR is aware of this, and takes special care to expand further on this creed, turning to its advantage the debate about the place of chance in evolution among evolutionists themselves, such as that between Stephen J. Gould and Richard Dawkins: the occurrence of mass extinctions, in addition to the ever-changing environmental conditions, is proof enough for them that natural selection happens completely by 'blind chance'.[16]

Their exact comprehension of 'chance' is never dwelled upon; it is simply defined in its loosest sense, as the opposite of order and of design, and is sometimes even equated with sheer chaos – in complete disregard of the relations between chance and order developed in chaos and probability theories. This vagueness conveniently allows them not to consider the fact that scientific randomness regarding mutations is certainly not synonymous with pure indeterminism, and decidedly not with chaos.[17] The implied consequence of probability theory that even as a random process evolution could yield predictable outcomes, and therefore would not per se be opposed to, nor incompatible with, an underlying purpose or design (as developed by statistician David Bartholomew), is similarly overlooked.[18]

15 Morris, J '"Natural" selection versus "supernatural" design', http://www.icr.org/article/352/207/, an article posted on the ICR website by its current president.

16 Guliuzza, R. 'Natural selection is not "nature's intelligence"', *Acts & Facts* (2010) 39 (5), 10-11, http://www.icr.org/article/natural-selection-not-natures-intelligence/.

17 Kitcher, P. calls it the 'randomness ploy'; see his excellent refutation of YEC arguments in his book *Abusing Science: The Case Against Creationism*, Cambridge: MIT Press (1998).

18 See Bartholomew, D.J. *God of chance*, London: SCM Press (1984) (out of print but made freely available by the author on godofchance.com); 'Probability, statistics and theology', *Journal of the Royal Statistical Society A* (1988) 151(1), 137-178 (especially p. 143-148); and *God, chance and purpose*, Cambridge: Cambridge University Press (2008). The author offers a brief presentation of his ideas on http://www.srforum.org/articles/god-or-chance/.

On the other hand, chaos theory and the finding of ordered complex patterns such as fractals in seemingly unorganised systems is understood as further evidence that there is an underlying, overall order in our universe.[19] Nonetheless, there is one exception to this ambiguity: 'chance' can indeed be understood in its statistical meaning, as related to laws of probability, but apparently only when applied to evolution as a global process. Waiving values stemming from unknown calculations but aiming to prove that life or DNA could never have occurred by chance, creationists indeed often argue that, even if the generation of design by chance were not a logical impossibility, it would remain such a statistical improbability as to be near to impossible:

> Creationists maintain that highly ordered systems could not arise by chance, since random processes generate disorder rather than order, simplicity rather than complexity and confusion instead of 'information'. … It is very clear that the probability of the *chance* occurrence of any kind of 'information' in a system is very small, and that this probability rapidly diminishes as the complexity of the system increases. … This means that, whenever one sees any kind of real ordered complexity in nature, particularly as found in living systems, one can be sure this complexity was *designed*.[20]

Order and design, on the other hand, serve as near-synonyms when they refer to the inner organisation of organisms or of ecological systems, although design can also stand for the 'divine plan' behind creation, thus signifying both the blueprint and the intention of the person in charge.[21] However, the author of both order and design is, without a shadow of a doubt, God:

> Ordered systems or structures do not happen spontaneously. We never observe orderliness occurring by accident, without an intelligent cause to direct the order. … These processes don't happen randomly but are divinely caused by God. God is the Author and Organizer of orderliness.[22]

Designed by God, the universe follows its foreseen destiny, towards its predetermined finality: 'God designed humanity to enjoy the happiness of stability, the happiness of productivity, and the happiness of success.'[23] Consequently, God would never have abandoned mankind nor any living being to such a 'heartless' process as evolution: 'the omnipotent God of

19 Morris, H. 'Can order come out of chaos?', http://www.icr.org/articles/view/819/207/.

20 Morris, H. 'Probability and order versus evolution', www.icr.org/article/probability-order-versus-evolution/.

21 We owe this useful distinction to McLaughlin, P. 'Reverend Paley's naturalist revival', *Studies in History and Philosophy of Biological and Biomedical Sciences* (2008) 39, 29.

22 ICR 'God caused order', http://www.icr.org/intelligent-cause/.

23 ICR 'God caused meaning', http://www.icr.org/meaning-in-life/.

Creation is thus the ever-sustaining and ever-caring God of providence'.[24] The purposelessness of evolution as advocated by Darwin and his followers is as contradictory to the Christian perspective as its randomness: 'Christianity teaches that God made the universe as a home for humans. If the universe evolved purely by natural means, then it just exists and any "purpose" for its existence can only be that which humans themselves attribute to it. … [NeoDarwinian] teachings are hardly neutral, but rather openly teach religion – the religion of atheism and nihilism.'[25] Darwinism is clearly the root of all evils found in contemporary Western societies. Design, finality, providence, purpose – none of them is clearly defined or differentiated; their reference to God and his will for his creation is the only trait that matters to creationists: all that Christians need to know is that this random, undirected, purposeless, naturalistic, atheistic and unscientific evolution is utterly unacceptable.

## Intelligent Design theory

Intelligent Design theory (ID) emerged in the mid-1980s with the publication of several books expressing open scepticism toward Neo-Darwinism and its ability to explain evolution – or toward evolution itself. Although coined in a 1989 high-school biology textbook (*Of Pandas and People: The Central Questions of Biological Origins*), the expression 'ID' was popularised in 1991 by Phillip Johnson in his opus *Darwin on Trial*, which marks the real beginning of ID as a well-organised movement at a scientific, philosophical and political level. A professor of law at Berkeley University and a born-again Christian, Johnson threw all his forensic skills into his new-found battle against Neo-Darwinism. 'Battle' is not too strong a word: aware of the quasi-instinctive rejection by the scientific community of any remotely religious element, Johnson decided that the reinsertion of religion into science was in dire need of a new approach, as he himself later explained in an interview in 2002.[26]

This battle strategy is still carried on today by the Center for Science and Culture (CSC), founded in 1996 under the more explicit name of 'Center for the Renewal of Science and Culture' in order to serve as 'intelligent design's primary intellectual and scientific headquarters'.[27] The CSC is itself an emanation of a Christian conservative think tank created in 1990, the Discovery Institute (DI). Challenging science on its own ground – a move similar to the one undertaken by creationism – is only the first step of the

24 Morris, H. 'God's work of providence', http://www.icr.org/article/gods-work-providence/.

25 Bergman, J. 'Darwinism: survival without purpose', *Acts & Facts* (2007) 36, 10; http://www.icr.org/articles/view/3513/211/.

26 Kushiner, J. 'Berkeley's radical: an interview with Phillip Johnson', *Touchdown* (2002) 15 (5).

27 Page dedicated to Stephen Meyer on the DI website, http://www.discovery.org/p/11.

long-term strategy of the CSC and the DI, as exposed in the *Wedge document*, a manifest written by the DI directors in 1998 and divulged a year later, forcing the CSC to acknowledge the link between ID and the broad aim of the DI – namely, to reinstall Christianity at the centre of the political, social and academic life of the United States. Regarding scientific matters, the religious premises and objectives of the DI are now plainly stated:

> Scientific research and experimentation have produced staggering advances in our knowledge about the natural world, but they have also led to increasing abuse of science as the so-called 'new atheists' have enlisted science to promote a materialistic worldview, to deny human freedom and dignity and to smother free inquiry. Our Center for Science and Culture works to defend free inquiry. It also seeks to counter the materialistic interpretation of science by demonstrating that life and the universe are the products of intelligent design and by challenging the materialistic conception of a self-existent, self-organizing universe and the Darwinian view that life developed through a blind and purposeless process.[28]

As detailed on the CSC website, 'defending free enquiry' entails supporting 'research by scientists and other scholars, challenging various aspects of Neo-Darwinian theory [and/or] developing the scientific theory known as intelligent design'.[29]

Another essential aspect of the ID movement is that ID theorists have always taken great care to differentiate ID from creationism, but also from theistic evolution – a movement within theology, also named evolutionary theology or theology of evolution, which aims to integrate evolutionary theory (carefully distinguished from Neo-Darwinism) into a new, broader theological framework through various articulation points (e.g. the alliance of chance and providence in quantum theory by physicist-theologians Robert Russell and John Polkinghorne, or directly in evolutionary theory by theologian John Haught).[30] This rejection is clearly illustrated by the barely concealed disdain of mathematician and philosopher William Dembski, one of today's most prominent ID theorists and Senior Fellow of the CSC, who bluntly stated that 'design theorists are no friends of theistic evolution. As far as design theorists are concerned, theistic evolution is American evangelicalism's ill-conceived accommodation to Darwinism'.[31]

28 DI 'About Discovery Institute', http://www.discovery.org/about.php.

29 DI 'About the Center for Science and Culture', http://www.discovery.org/csc/aboutCSC.php.

30 See e.g. Russell, R. *Cosmology: From Alpha to Omega*, Minneapolis: Fortress (2008); Polkinghorne, J. *Quarks, Chaos & Christianity: Questions to Science And Religion*, NY: Crossroad Publishing Company (2005); Haught, J. *Christianity and Science: Toward a Theology of Nature*, Maryknoll: Orbis Books (2007).

31 Dembski, W. 'What every theologian should know about creation, evolution and design', (1996), http://www.discovery.org/a/122.

Ironically, ID theorists are the objects of an identical censure by creationists: although they recognise it as a valiant attempt to put design back at its rightful place, creationists consider that ID presents the same failings as evolutionists – that it fails to take into account the Truth as revealed in the Bible.[32] Of course, ID theorists use the same argument in reverse – creationism is based on the Bible, which is unscientific; since ID is not, it can be classified as science.[33] Furthermore, the very acceptance of evolution by ID theorists is an argument by itself, as neither Dembski nor Behe (who provide today's major ID scientific grounding) claim to reject evolution. The design theorists' complaint does not concern evolutionary change per se, but rather the claim by Darwinists that all such change is driven by purely naturalistic processes which are devoid of purpose'.[34] It would be erroneous, however, to consider the CSC and creationists today fully opposed. ID is not a wholly unified movement; even if some ID proponents are theists, others are open creationists, be it in a Young Earth or an Old Earth movement.[35] ID theorists and creationists might be at odds regarding their arguments against Neo-Darwinism, but they appear to be theologically closer than one might suppose.

This depiction of ID is, we believe, essential to an understanding of why we treat it separately from creationism in this essay. It also allows us to underline the ideological premise of ID, which, according to our assessment, is far from the purely scientific theory it claims to be. As stated in one source:

> **Is intelligent design a scientific theory?**
> Yes. The scientific method is commonly described as a four-step process involving observations, hypothesis, experiments, and conclusion. Intelligent design begins with the observation that intelligent agents produce complex and specified information (CSI). Design theorists hypothesize that if a natural object was designed, it will contain high levels of CSI. Scientists then perform experimental tests upon natural objects to determine if they contain complex and specified information. One easily testable form of CSI is irreducible complexity, which can be discovered by experimentally reverse-engineering biological structures to see if they require all of their parts to function. When ID researchers find irreducible complexity in biology, they conclude that such structures were designed.[36]

32 Morris, H. 'Design is not enough !', *Back to Genesis* (1999), 127.

33 http://www.intelligentdesign.org/whatisid.php. This website is directly related to those of the CSC and the DI.

34 Dembski *op. cit.*, (31); Behe, M. 'Intelligent Design is not creationism',( 2000), http://www.discovery.org/a/286.

35 See respectively Behe, M. 'Irreducible complexity: obstacle to Darwinian evolution', in Dembski, W. & Ruse, M, (eds.) *Debating Design: From Darwin to DNA,* New York:Cambridge University Press (2004), p. 358; Jones, Judge E. III 'Kitzmiller vs Dover area school district', (2005), http://www.pamd.uscourts.gov/kitzmiller/kitzmiller_342. pdf, p. 32; Dembski *op. cit.,* (31).

36 www. *op. cit.*, (33).

This quotation allows us to delve into the core arguments of ID regarding the evolutionary process: the theories of 'complex and specified information' (CSI) exposed by William Dembski and of 'irreducible complexity' defended by Michael Behe.

What Behe called 'the theoretical foundation'[37] of ID was first published by Dembski fifteen years ago in his two books, *The design inference: eliminating chance through small probabilities* (1998) and *Intelligent Design: the bridge between science and theology* (1999). Dembski introduced intelligent design as 'the cure' to the 'disease' plaguing the scientific community: naturalism.[38] Quoting Monod, Dembski claims that 'chance and necessity have proven too thin an explanatory soup on which to nourish a robust science'.[39] By stubbornly refusing to acknowledge their inadequacy and accept design as a scientific hypothesis, scientists are only showing their unwillingness to abandon their naturalistic mindset, in other words their dogmatism. This is the reason behind the rejection of ID by the scientific community: not only is it mutually exclusive of their current evolutionary paradigm but it shakes their metaphysical world-view to its very core. Design will never be accepted by naturalistic scientists. However, if they are true scientists, they will accept irrefutable evidence: 'in short, if we're going to show that naturalism is false, we need to locate observable features of the world that demonstrate design'.[40]

In order to achieve this in a scientific way, an objective criterion to recognise design in nature is required – which is exactly how Dembski presents his CSI theory. Fortunately for us, he explicitly clarified his comprehensions of 'design':

> I'm using *design* in three distinct senses. First, I use it to denote the scientific theory that distinguishes intelligent agency from natural causes, a theory that increasingly is being referred to as *design theory* or *intelligent design* (ID). Second, I use *design* to denote what it is about intelligently produced objects that enable us to tell that they are intelligently produced and not simply the result of natural causes. … It is *design* in this sense – as a trademark, signature, vestige or fingerprint – that this criterion for discriminating intelligently from unintelligently caused objects is meant to identify. Lastly, I use *design* to denote intelligent agency itself. Thus to say that something is designed is to say that an intelligent agent caused it.[41]

Dembski usually uses *design* under its second meaning; however, he

37 In his foreword of the 2002 edn of Dembski, W. *Intelligent Design*, Downers Grove, Ill: InterVarsity Press (2002), p. 12.

38 Dembski *op. cit.*, (37), p. 120.

39 Dembski *op. cit.*, (37), p. 125.

40 Dembski *op. cit.*, (37), p. 120.

41 Dembski *op. cit.*, (37), p. 127, italics in original.

does not always seem to make the proper distinction between design as the aspect of an object and design as an intelligent agency – between design and designer.

In order to understand Dembski's scientific and objective design-detecting method, we also need to grasp his understanding of chance. 'Contingency' is commonly used and appears to mean that an event cannot be solely explained by algorithms or natural laws (e.g. the position of scrabble pieces on a game board depending on more than physical laws)[42] or that a process has multiple alternative possibilities (the chosen possibility being contingent).[43] Contingency is sometimes distinguished from chance as randomness construed as a relative notion: 'randomness should be properly thought of as a provisional designation that applies only so long as an object violates all of a set of patterns. Once a pattern is added that the object no longer violates but rather conforms to, the object suddenly becomes nonrandom.'[44] This definition, however, is somewhat confused: when asked the subsequent question as to the criteria by which we recognise an event as random (since there could always be a pattern it violates), Dembski answered by citing our instinctive understanding of chance. Some patterns will spontaneously be judged as chance outputs and others not, even at equal probabilities. As such, 'we think of randomness not only in terms of patterns that are alternately violated or conformed to, but also in terms of patterns that are alternately hard or easy to obtain by chance'.[45] This is a common misconception, termed the gambler's fallacy, and as a mathematician, Dembski must be well aware of it. Chance, in this case, seems to be understood as 'luck' or 'coincidence', in its most anti-deterministic way.

Codifying this instinctive, unscientific comprehension is at the heart of his method, which he christened 'complexity-specification criterion' or 'explanatory filter'. Dembski notes that when studying an object, three traits must be simultaneously refuted to prove it has been designed: contingency, complexity and specification. In Dembski's words, 'contingency ensures that the object in question is not the result of an automatic and therefore unintelligent process that had no choice in its production. Complexity ensures that the object is not so simple that it can be readily explained by chance. Finally, specification ensures that the object exhibits the type of pattern characteristic of intelligence.'[46] 'Contingency' means that the object was not produced out of necessity, that is, because of algorithms or natural laws that would inevitably lead to its appearance. 'Complexity' is construed as the inverse of probability – the more complex, the less prob-

42 Dembski *op. cit.*, (37), pp. 128-130.

43 Dembski *op. cit.*, (37), pp. 153-154.

44 Dembski, W. 'The logical underpinning of Intelligent Design', in Dembski & Ruse *op. cit.*, (35), p. 312.

45 Dembski *op. cit.*, (44), p. 313.

46 Dembski *op. cit.*, (37), p. 128.

able. 'Specification' presents a greater difficulty: Dembski considers that the presence of patterns – of complexity – is not enough to infer design; he is fully aware that patterns can be found virtually anywhere if one searches hard enough. In order to avoid this situation, expected patterns in statistics (or in any branch of science) must be drawn up before the analysis – rendering them independent from the studied phenomenon. Dembski uses several examples, one of which being an archer shooting arrows at a wall. If he shoots first and draws his target round his arrow afterwards, the target – the pattern – is dependent on the arrow's trajectory. Conversely, if he shoots into a pre-determined target, the event can only be attributed to his skill (provided it is sufficiently difficult to eliminate necessity and chance), that is, to design. The shot is of course dependent on the target; hence, Dembski writes that a pattern must be independent 'in a certain well-defined sense'.[47] If contingency alone is enough to dismiss necessity, a pattern must be both complex and specified in order to reject chance, leaving design as the only explanatory option.

Having thus formalised CSI, Dembski goes on to prove that information cannot be created by algorithms or natural laws: these can only transmit information, not originate it, because both are deterministic and as such cannot produce contingency, whereas information – and CSI – requires contingency, defined as the possibility of multiple alternatives to the actualised event. Every result predicted by a law can be – by definition – predicted and hence predetermined, whereas the contingency of an event implies that it is only compatible with, but not required by, said laws, and is actually irreducible to them. In other words, the sole knowledge of natural laws – or even laws of probability – could never generate information regarding the spatial position of scrabble pieces. On the other hand, chance will not suffice either, due to the near-infinite improbability of its generating complex *and* specified information. No possible combination of chance and laws would hence be able to create CSI – 'natural causes are incapable of generating CSI': this is Dembski's Law of Conservation of Information.[48] Information must have come from outside the system – enter design.

Dembski's theorem is tidily written, but its weakness resides in its very foundation: Dembski's a priori opposition of design, law and chance. There is no antagonism between law and chance, be it contingency or randomness – laws of probability merge both. Contingency and randomness are indeed only conceivable in a context governed by laws – how could they be expressed outside any structuring system? Contingency, under its common meaning, is not only producible but is very much generated by law. Dembski's contrast between design and chance is equally forced, and

47 Dembski *op. cit.*, (37), p. 133.
48 Dembski *op. cit.*, (37), p. 170.

Dembski himself concludes a presentation of his complexity-specification criterion in this way:

> The use of chance here is very broad and includes anything that can be captured mathematically by a stochastic process. It thus includes deterministic processes whose probabilities all collapse to zero and one. … It also includes non-deterministic processes, such as evolutionary processes that combine random variation and natural selection. Indeed, chance so construed characterizes all material mechanisms.[49]

When explicitly stated this way, Dembski's criterion leads to an either/or choice: either design or chance. Since chance so obviously refers to the 'Darwinian mechanism' of evolutionary theory, and design in Dembski's own words means primarily ID, Dembski's framework appears strikingly similar to that of creationists' and readily ignores all attempts by evolutionists to transform the issue from 'chance versus design' into 'evolution versus design'. Such a parallelism with creationism is easily reinforced by the similarity of their vocabularies – the interdependency of information, complexity, order and probability as 'evidence' for design has already be mentioned in the previous section.[50]

A similar remark can be made regarding CSI itself. The inability of natural causes to produce CSI is embedded in Dembski's very definition of *complex* specified information, since complexity is typified as the inverse of probability: 'the principal requirement for exhibiting specified complexity is the requirement that some structure/system cannot be (or is highly unlikely to be) actualised by natural causes. [Dembski's opinions are] at best, trivially true. They are nothing more than tautological statements.'[51] Furthermore, when applying his theory to evolution, Dembski specifically denies natural selection the ability to generate CSI, since natural selection cannot specify its pattern in advance: it has no memory of the past and no purpose for the future, and hence any imaginable CSI would have to be produced in a single generation – which is statistically impossible. This, however, relies on Dembski's characterisation of his theory as holistic, which admittedly 'is built directly into the definition of CSI … CSI does not emerge by merely aggregating component parts. CSI is not obtained by arbitrarily stitching items of information together. Only if a specification for the whole is given can parts be suitable arranged to form CSI.'[52] Such definition is completely unsuitable for biological structures, especially in the context of evolutionary theory that, as we have seen, is thought of as a gradual process.

49 Dembski *op. cit.*, (44), p. 321.

50 See e.g. Morris, H *op. cit.*, (19).

51 Van Till, H. 'Are bacterial flagella intelligently designed? Reflections on the rhetoric of the modern ID movement', *Science and Christian Belief* (2003) 15, 136.

52 Dembski *op. cit.*, (37), p. 174.

Yet this very idea is central to Dembski's argument, as well as to Michael Behe's own hypothesis of irreducible complexity. Presented in his opus *Darwin's Black Box* in 1996, it has since been reused by Dembski himself as a biological example of CSI.[53] Irreducible complexity 'is just a fancy phrase I use to mean a single system which is composed of several interacting parts, and where the removal of any one of the parts causes the system to cease functioning'[54] – a definition indeed well matched with CSI theory. Design is hence easily formalised: 'it is simply the purposeful arrangement of parts'.[55] Chance, on the other hand, seems to be limited to scientific randomness, although Behe's later works are construed within Dembski's larger theoretical conception. Behe's classical example is the common mechanical mousetrap, and his paradigmatic biochemical system is the bacterial flagellum, a highly complex structure composed of over forty proteins working like a rotor and allowing bacteria to move around. In Behe's hypothesis, Darwin's black box refers to the eye – the complex organ whose formation Darwin found himself unable to justify by small, gradual steps – and even though it has been initiated, scientists are nowhere nearer a complete explanation of vision, much less of its evolution.[56]

As a matter of fact, Behe considers such an exhaustive theory beyond the reach of science. Models have since then been proposed for the evolution of the bacterial flagellum, detailing how particular individual proteins had autonomous functions and came to interact, thus progressively building up the system, yet all have been found wanting. It appears that this will always be the case: Behe considers that irreducible complexity includes the purpose of a system as a whole, in other words that models breaking down the complex system to unravel its formation in a step-by-step fashion are not addressing the actual issue: 'I emphasize strongly, *the problem of irreducibility remains, even if individual proteins homologous to system components separately and originally had their own functions*.'[57] Since evolutionary models *always* unfold the formation of a complex structure as a gradual process starting from singular components, they are bound to be mutually exclusive with Behe's irreducible complexity – exactly like Dembski's holistic definition of CSI.

In both arguments, ID strikes one as utterly similar to the God-of-the-gaps creationist theory, where God as an option must be abandoned once Darwinian mechanisms have been unveiled – although science, by definition, never quite seems capable of meeting this challenge within any

53 Dembski *op. cit.*, (37), pp. 146-149.

54 Behe, M. 'Evidence for Intelligent Design from Biochemistry', (1996), http://www.discovery.org/a/51.

55 Behe *op. cit.*, (54).

56 Behe *op. cit.*, (54).

57 Behe, *op. cit.*, (54), p. 359, emphasis in original.

of these frameworks.[58] ID's affinity to creationism appears even greater when one considers the premises implied by Dembksi's answer to dysteleology: design is not so much suboptimal as perverted due to evil and to the Fall.[59] Far from being scientific, such a reply is nothing short of a full theological perspective of nature. It would prove more interesting from a scientific standpoint to apply Dembski's criterion to other structures than Behe's self-proclaimed irreducibly complex systems. If we can indeed detect design, then a whole new branch of science opens up. Where is design to be found? Is it quantifiable? What are the mechanisms behind design? These questions were asked twelve years ago by philosopher Gregory Peterson and have yet to be answered. Ten years ago, Dembski himself was privately acknowledging the insufficiency of ID scientific research.[60] Peterson kindly stated that 'at best, [ID was] a science waiting in the wings'.[61] Today, ID's definitions of chance and design are still empirically untested.

## Scientific materialism

The adoption of scientifically-based claims which go beyond the boundaries of science is also deemed a hallmark of scientific materialism, or more broadly of scientism. The scientific approach is admittedly based on a methodological naturalism (science focuses on nature only and is not equipped to observe what may lie beyond matter) and on an operational reductionism (each scientific discipline studies nature with its own methods).[62] However, scientific materialism, or scientific naturalism, transforms these methodological caveats into ontological statements by subscribing to two additional assumptions: the first one being epistemological ('the scientific method is the only reliable path to knowledge') and the second metaphysical ('matter (or matter and energy) is the fundamental reality in the universe').[63] In contrast to science as a method, scientific materialism as a philosophy is consequently atheistic by nature and draws its conclusions about the non-existence of deities from its scientific knowledge – wherein lies the scientistic fallacy, to use Gregory Peterson's

58 See e.g. Ruse, M. *Can a Darwinian Be a Christian? The Relationship Between Science and Religion*, Cambridge: Cambridge University Press (2000), p. 122; or Van Till *op. cit.*, (51), p. 127.

59 Dembski *op. cit.*, (37), p. 264.

60 Peterson, G. 'The Intelligent–Design movement: science or ideology?', *Zygon* (2002) 37 (1), 19-21; Dembski, W. 'Becoming a disciplined science: prospects, pitfalls and reality checks for ID', (2002), http://www.discovery.org/a/1784.

61 Peterson *ibid*.

62 Barbour, I. 'Taking science seriously without scientism: a response to Taede Smedes', *Zygon* (2008) 43, 261; Peterson, G. 'Demarcation and the Scientistic Fallacy', *Zygon* (2003) 38, 753-754.

63 Both are quotations from Barbour *op. cit.*, (9), p. 78; see also Stenmark, M., 'What is scientism?', *Religious Studies* (1997) 33, 24.

expression.[64] Two prominent figures of the creation/evolution debate are proud self-proclaimed ambassadors of this ideology: philosopher Daniel Dennett and biologist Richard Dawkins.

As already hinted at, the exact importance of chance in the evolutionary process remains ill-defined, a situation mostly related to the role attributed to natural selection. This debate has been personified by Richard Dawkins and by paleontologist Stephen J. Gould.[65] Whereas Dawkins confers on non-random, law-like natural selection the central position in evolution, Gould considers chance, history and contingence to play crucial roles in evolution, primarily through the likes of mass extinctions, against which the level of fitness of a given organism – natural selection at work – is powerless. This underplaying of natural selection has unsurprisingly delighted opponents of evolution of all sorts. However divergent the emphases they may give to evolution, Dawkins and Gould do not, on the other hand, differ on its core – random mutations selected by non-random natural selection through their effect on the organism's adaption to its current environment (or fitness), with the additional accidental occurrences of unexpected major environmental changes. Chance is here confined to two main levels in evolution: mutations and catastrophes.

Before detailing further Dawkins's and Dennett's premises, we must take a brief detour through an oft-quoted book on chance – Jacques Monod's work *On Chance and Necessity*. The most famous part of this book is apparently the antepenultimate sentence: 'Man knows at last that he is alone in the universe's unfeeling immensity, out of which he emerged only by chance.'[66] Emphasis on this section hides the fact that Monod did not consider evolution to be a random process at all. On the contrary, he insisted that only genetic mutations were random, while natural selection merely acted on chance's products, but was actually following a rigorous necessity.[67] Evolution is a mixed mechanism of chance and necessity – ergo the book's title. The last paragraph of the book refers more to the emergence of life, a chance event in Monod's eyes. Unfortunately, Monod did not expand on these concepts, and we have no precise idea of the type of chance and necessity he envisages regarding evolution, although his few references to the laws of probability point at least to a possible statistical meaning of chance. Nonetheless, Monod expressed in his book the common standpoint of biologists both in his time and since.

In complete agreement with Neo-Darwinian theory (that is, very succinctly put, Darwinian intuitions plus biochemistry and genetics), Dawk-

64 Peterson, G. *op. cit.*, (60), 751-761.

65 Peterson, G. 'Whose evolution? Which theology?', *Zygon* (2000) 35, 221-232; Sterelny, K. *Darwin vs Gould: Survival of the Fittest*, Duxford: Totem Books (2001).

66 Monod, J. *On Chance and Necessity*, quoted in Barbour *op. cit.*, (9), p. 80.

67 Monod, J. *Le hasard et la nécessité, essai sur la philosophie naturelle de la biologie moderne*, Paris: Seuil (1970), p. 135.

ins relentlessly insists on the non-randomness of evolution and the restriction of chance to genetic mutations (and, begrudgingly, to catastrophes): 'the randomness of mutation is partly responsible for the widespread, ludicrous misconception that natural selection itself is a random process'.[68] On the contrary, 'the achievement of non-random natural selection is to tame chance':[69] every manifestation of chance at the mutation level is filtered by natural selection through the change in fitness which mutations bring to the organism.[70] As Dawkins puts it, natural selection is the means by which environmental information is integrated into an organism's genome – how an organism adapts to its changing milieu. That natural selection is far from being a purely random process is strongly illustrated by a phenomenon called evolutionary convergence, which characterises the fact that 'independent lines of evolution appear to have converged, from very different starting points, on what looks very like the same endpoint'.[71] Examples of convergent evolution are countless (one of the most famous being the resemblance between the eye of mammals and cephalopods). As further developed by another palaeontologist, Simon Conway Morris, they underline the importance of environmental pressure in evolution – similar solutions being selected in response to challenges posed by similar physical constraints. Evolutionary convergence simultaneously highlights the intrinsic and extrinsic restrictions imposed on evolution by the genome of a given organism and its environment, respectively.[72]

Furthermore, natural selection (and thus evolution) is a cumulative process: it operates with each generation of organisms, and what we now see as different species are the results of a near-infinite number of these generations – the outcomes of an accumulation of small steps of selection. This gradual aspect of evolution both renders it somehow 'directed' as only 'good' genes are selected (that is, genes which increase the organism's fitness), and answers for its non-randomness. This tackles the creationists' argument from improbability: of course, Dawkins agrees, it is highly improbable that new species or even radically different phenotypes would appear by chance in one generation, and of course, a theory relying so

68 Dawkins, R. 'Natural "knowledge" and natural "design"', http://richarddawkins.net/articles/129-natural-39-knowledge-39-and-natural-39- design-39.

69 Dawkins, R. The illusion of design, http://www.naturalhistorymag.com/htmlsite/1105/1105_feature1_lowres.html.

70 Dawkins, R. *The Blind Watchmaker*, New York: Norton (1996), p. 288. The whole chapter 3 is dedicated to demonstrating the non-randomness of cumulative natural selection.

71 Dawkins *op. cit.*, (70), p. 94.

72 See e.g. Conway Morris, S. *Life's Solutions: Inevitable humans in a lonely universe*, Cambridge: Cambridge University Press (2003), esp. pp. 299-310. See a summary in Conway Morris, S. 'Evolution and convergence: some wider considerations', in Conway Morris, S. (ed.) *The Deep Structure of Biology*, West Conshohocken, PA: Templeton Foundation Press (2008), pp. 46-67, or in the reprint of his Boyle Lecture (2005) 'Darwin's Compass: How Evolution Discovers the Song of Creation', *Science and Christian Belief* (2006) 18, 5-22.

much on chance would not be scientific at all; but as a matter of fact as this does not occur the argument is void.[73]

At the same time Dawkins destroys the argument from design, which to his mind is in fact barely an argument at all: 'such-and-such looks designed, therefore it was designed'.[74] He rather disdainfully christens it 'the Argument from Personal Incredulity'[75] – that is, the free admission of one's inability to understand how a given feature could have emerged from evolution. Not only have evolutionists readily replied to most of the queries posed by sceptics, but it is not even an argument as such. Dawkins likens it to the sheer incredulity one can show when faced with an impressive magic trick. Moreover, pointing to current gaps in a theory does not disprove that theory, and in any case does not make any alternative theory true by default.[76] Notwithstanding, the 'illusion of design', to use Dawkins's own wording, is easily justified by the cumulative selection of mutations towards an ever-better adapted organism.

Dawkins dwells at more length on the concept of random mutations in *The Blind Watchmaker*.[77] If randomness is understood as pure indeterminism – as it is by most creationists – then there are several ways in which mutations are, as a matter of fact, not random at all. Noting the influence of chromosomal localisation and external, environmental factors, Dawkins adds another crucial element: mutations are not random regarding the effects they can produce on an organism's phenotype; they are indeed restricted by pre-existing constraints – by what the organism is able to do when they occur. Why then are mutations portrayed as bringing chance into the evolutionary process? Because they are random relative to the change of fitness that they bring: mutations are completely disconnected from the organism's environment, and whether or not they improve the organism's adaptation to its environment is left to chance. Tying these elements together shows that, in Dawkins's system, mutations themselves are not fully random while their effects on fitness relate to chance in its loosest sense.

Let us return to the direction of evolution evoked at the beginning of this section. This directedness has been clarified by Dawkins as different from a purpose of any kind, and certainly from the notion of progress as it is commonly understood. Evolution as a global process does not carry purpose or even directionality – it is a branching tree, not a ladder with mankind on top. At most, progress could be applied to a continuously improved adaptation within a given lineage, with the strict exception of mankind.

73 Dawkins *op. cit.*, (69).
74 Dawkins *op. cit.*, (70).
75 Dawkins *op. cit.*, (70), p. 38.
76 Dawkins, R. *The God Delusion*, London: Bantam Press (2006), pp. 125-126, 128- 129.
77 Dawkins *op. cit.*, (76), pp. 306-312.

Dawkins explicitly refuses any extension of evolutionary theory to ethics – and signally not any kind of 'social Darwinism' or related movements.[78]

Logically, Dawkins himself sees no purpose at all in the universe, although this has no bearing on the existence of purpose or meaning at the level of a human life: 'The universe we observe has precisely the properties we should expect if there is, at bottom, no design, no purpose, no evil and no good, nothing but blind, pitiless indifference.'[79] As a matter of fact, he seems to fall prey to his own Argument from Personal Incredulity: as no purpose has ever been detected by empirical means – as no purpose can be imagined for our world – our universe has no purpose at all. Dawkins goes further than deriving the conclusion of evolution's purposelessness from scientific data; he transforms this absence of results into a positive affirmation (an unjustified and quite unscientific extrapolation) and extends this metaphysical perspective to the whole cosmos. Although the scientific basis is in agreement with current data, the conclusion is beyond scientific grounds – a perfect case of scientistic fallacy.[80]

Daniel Dennett attributes an equally essential role to natural selection in evolution and devotes an entire book to evolutionary theory: *Darwin's Dangerous Idea: Evolution and the Meanings of Life* (1995). He considered natural selection an algorithmic process, a qualification taken up by Dawkins and others. Dennett defines an algorithm as

> a formal process that can be counted on – logically – to yield a certain kind of result whenever it is 'run' or instantiated. … Three key features of algorithms are important here: substrate neutrality … underlying mindlessness … guaranteed results.[81]

Dennett directs the readers to the implementation of this definition by Alan Turing and his computational machines, which are able to perform perfect arithmetic while having no comprehension of it. For him, this is exactly where what he christened 'Darwin's strange inversion of reasoning' lies: in order to achieve something complex, there is no need to understand, as long as the process can be broken into small, simple, mindless steps.[82]

One might object that algorithm-using machines such as computers are created with an intelligent supervision – they are designed by man. Should it be deduced that natural selection has been designed as well? The

78 Miele, F. 'An interview with Richard Dawkins', *Skeptic* (1995) 3, 80-85.

79 Dawkins, R. *A River Out of Eden*, New York: Basic Books (2005), p. 133.

80 See Stenmark, M. 'Evolution, purpose and God', *Ars Disputandi* (2001) 1 (4) for a discussion of this argument.

81 Dennett, D. 'Darwin's Dangerous Idea', in *The Sciences*, May/June 1995. This article is made up of excerpts from Dennett, D. *Darwin's Dangerous Idea*, London: Penguin Press (1995). Future references are to this book.

82 Dennett, D. 'Darwin's "strange inversion of reasoning"', *Proceedings of Nat. Acad. of Sciences* (2009) 106, supp. 1p.

answer to this question is a resounding 'no': 'who designed that cascade [of algorithmic processes]? Nobody. It is itself the product of a blind, algorithmic process.'[83] If anything, the evolutionary algorithm appeared concomitantly with and as the outcome of the emergence of life, when unicellular organisms first thrived and achieved survival in their environment.

But Dennett's major argument regarding algorithms is his distinction between order and design, which he first attributes to Darwin himself:

> At first stab, we might say that Order is mere regularity, mere pattern; Design is Aristotle's *telos*, an exploitation of Order for a purpose, such as we see in a cleverly designed artefact. The solar system exhibits stupendous Order, but does not (apparently) have a purpose – it isn't *for* anything. An eye, in contrast, is *for* seeing.[84]

Before Darwin, both order and design came from God, but his exposition of how design could come out of order led to a radical change of mindset:

> Give me Order, [Darwin] says, and time, and I will give you Design. Let me start with regularity – the mere purposeless, mindless, pointless regularity of physics – and I will show you a process that eventually will yield products that exhibit not just regularity but purposive design.[85]

Natural selection as an algorithm is ordered and creates design in a Neo-Darwinian sense – a good adaptation to one's environment.

Thus design, for Dennett, does not suppose the existence of a designer, but simply that there is some kind of purpose, be it a physiological function for an organ or merely survival for an organism. The relationship between design and progress remains open; Dennett says only that 'there is no fixed agreement among evolutionary theorists about this'.[86] The philosopher himself seems to restrict the notion of purpose to the smallest levels of evolution, and certainly not to evolution as a whole, where he sees no finality, nor any kind of teleology or divine providence.

Like Dawkins, Dennett does not think highly of the argument from design, which in his mind simply begs the question of features being too complex to be evolved. Moreover, it implies that these features are too important to come from 'mindless, purposeless forces', an 'ill-examined prejudice' in itself.[87] As a matter of fact, design is discernible only if and where we expect it: we see design where the process, or the organism, meets our a priori definition of the optimal solution to a certain issue.[88] Consequently, the argument from design is even weaker, if not completely nullified.

83 Dennett *op. cit.*, (81), p. 59.
84 Dennett *op. cit.*, (81), p. 64.
85 Dennett *op. cit.*, (81), p. 65.
86 Dennett *op. cit.*, (81), p.141; see also p. 126.
87 Dennett *op. cit.*, (81), p. 66; see also pp. 28-33.
88 Dennett *op. cit.*, (81), pp. 130-133.

As expected, the random part of evolution arises in mutations. Dennett readily notes the 'marriage of chance and necessity [as] the hallmark of biological regularities',[89] where necessity refers to biological and environmental constraints and chance to mutations. Genetic mutations are random as 'undirected' and occur out of 'blind chance', an expression that is also applied to the execution of algorithms.[90] Quite surprisingly for a philosopher, Dennett rarely discriminates between randomness and chance, accident and luck; in some circumstances, the process is even defined as undesignedness or chaos. Despite this confusion, Dennett appears to qualify mutations as statistically random and catastrophes as accidents. The concept of chance is, in all its possible meanings, always opposed to teleology and design.

As we can see, Dawkins's and Dennett's visions of evolution are quite similar: a mindless, purposeless, but non-random process that selects random mutations through their phenotypical effects. Their exact definition of design or purpose differs slightly, but leads them to the same conclusion – there is no need, nor even place, for any kind of external intervention. In that matter, they agree with creationists. It is not entirely on these premises, though, that they reject religion, Dawkins much more radically than Dennett. The traditional issue of pain and evil is also at stake, as well as their understanding of evolution as explaining morality and religion – God is a product of our minds, an outcome of evolution.[91] Dawkins subsequently takes delight into turning the argument from improbability back against its supporters: if a complex structure like the eye is so improbable, how much more improbable must be an infinitely complex being such as a deity! The complete implausibility of its existence makes creationists the first victims of this argument.[92]

## Conclusion

Despite their official rejection of one another, creationists and ID theorists are clearly aligned in their implicit comprehension of the role of chance in evolution, of divine design and providence, and of their mutual antagonism. In both movements, the crux of the argument does indeed rely on the understanding of chance as the primary force driving evolution and as naturally opposed to design, which is itself posed as the only possible alternative to chance and as a direct proof of concept of a divine designer. The debate is here clearly set between chance and design – between the supposedly antithetical world-views of evolution and Christianity.

89 Dennett *op. cit.*, (81), p.129.

90 Dennett *op. cit.*, (81), pp.355, 323 and 59, respectively.

91 Gers, M., 'Memes vs God: Dennett and Dawkins take on religion', *The Journal for the Study of Religion, Nature and Culture* (2008) 2, 508-520.

92 See e.g. Dawkins *op. cit.*, (69).

Quite unexpectedly, the intrinsic link between design and designer, and the comprehension of divine design as permeating the whole evolutionary process up to and including every single mutation, appears to be shared by scientific materialists – only Dennett makes a slight effort to distinguish design from God's blueprint, but in effect discriminates between the two concepts as rarely as Dembski. A similar conclusion may be drawn from the global conception of evolution – in all movements, it is deemed mindless and purposeless, and as such incompatible with a divine designer and henceforth with Christianity.

However, scientific materialists stand clearly at odds with creationists and ID theorists regarding the definition and extent of the role of chance in evolution. Unsurprisingly, their scientific premises – randomness of mutations with respect to the organism's fitness and non-randomness of natural selection – are in perfect agreement with current Neo-Darwinist theories and lead to a vision of evolution as a process of chance and law. In contrast to their opponents, they therefore position the controversy between evolution – not chance – and design. The failure of creationists and ID theorists to understand this divergence of perspective – the actual scientific stance on chance in evolution – dooms not only their whole theoretical construction and their attempt to overthrow Neo-Darwinism in the scientific community, but also the establishment of any kind of fruitful dialogue on the broader issue of the mutual relations between science and religion.

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