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Chance in evolution:

Theological threat or providential opportunity?

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I. Introduction

For over a century and a half now, the theory of evolution has been at the center of one of the core debates between scientists and theologians of all faiths. One of the most disputed questions is whether the chance inherent to evolutionary processes is, or is not, opposed to the theological comprehension of the world as a created, designed and finalized reality. A recent illustration of the tensions surrounding that topic took place in 2005, when Archbishop of Vienna Cardinal Christoph Schönborn's short condemnation of neo-Darwinism as incompatible with Catholicism was followed by a very heated debate about chance, necessity and neo-Darwinism itself[1].

Various positions have emerged over time, either antagonizing 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 now endeavor to clarify.

A. Chance and design: an old debate

The issue of chance in evolution and of divine design appeared from the very start, and the roots of current arguments can already be found in the early debates. In this regard, the correspondence of Charles Darwin with his long-time friend Asa Gray is enlightening[2]. Gray was an American botanist and a fervent supporter of Darwin's ideas, but also a devout Christian who never wavered in his belief of the world's divine origin and design. As such, although he agreed in principle with the theory of natural selection based on variations, he tended to see a divine hand behind the scene – especially as the physical causes of the observed variations were, from Darwin's own admission, unknown. This first cause would then direct natural selection – an intermediate or second cause – along a beneficial road, toward a better world. This vision greatly puzzled Darwin, who found it difficult to grasp how exactly such a pain- and death-filled nature could be guided by a benevolent will – an

[1] The article is available on the *New York Times* website. The Cardinal has further expressed himself through nine catechetical lectures on the topic of evolution, available on the website of the Archdiocese of Vienna. See also S. BARR, *The design of evolution*; P. BYRNE, *Evolution, randomness and divine purpose: a reply to Cardinal Schönborn*.

[2] This section is based on J. LENNOX, *The Darwin/Gray Correspondence*. See also Th. HOQUET, *Darwin teleologist ?*.

admittedly not-so-recent hurdle in Christian theology, but which took on a new meaning with evolutionary theory[3].

Regardless of the moral background, Darwin's inner indecision regarding chance and design was still unresolved, even after the publication of the *Origin of Species* in 1859. His predicament arose from the 'perceived conflict between the general *orderliness* of nature, which leads him to doubt a role for chance in nature's productions, and a certainty that much of what happens in nature is not the result of any *design*'[4]. The question was first asked as a 'chance *or* design' choice, and much of Darwin's uncertainty came – unsurprisingly – from an initial lack of precision regarding his use of the word 'chance', which he progressively refined. 'Chance' – or its cognate adjective, fortuitous – can be applied to the two main steps of evolution, variation and selection, but in opposition to two different concepts: variations arise by *accident* – as opposed to *design* – and are selected by the environment – chance is here opposed to *determinism*[5]. However, it must be noted that part of the issue also rests with what Gray and Darwin deemed to be 'designed' – that is, not only the world at a global level, not only the evolutionary process *per se*, but each single variation. For Darwin, such a belief could not be reconciled with the concept of natural laws, and especially not with evolutionary randomness[6]. Variations are not caused by *chance* if chance means outside of natural laws, but they are definitely not *designed* – otherwise, every single step of natural history would already have been determined and the very notion of 'natural laws' becomes useless[7]. As we shall see, what is encompassed by 'design' will also vary largely and influence the chance/design debate.

B. Biological understandings of the concept of chance

This brief historical encounter has already provided us with two different meanings of the word 'chance'. In addition, Darwin also hinted at today's probabilistic laws by mentioning the 'chance of appearance' of variations and used the word, at a completely different level, as a

[3] J. LENNOX, *The Darwin/Gray Correspondence*, p. 463.
[4] J. LENNOX, *The Darwin/Gray Correspondence*, p. 464.
[5] J. LENNOX, *The Darwin/Gray Correspondence*, p. 464 and p. 467-468.
[6] Notwithstanding his incomprehension as to why a benevolent being would willingly cause so much suffering and pain, as abovementioned. Interestingly, this issue seems final for Gray, who, although unrelentingly advocating God's role in evolution, privately admitted to not being able to oppose any valid argument: 'I found your stone-house argument unanswerable in substance (for the notion of design must after all rest mostly on faith, and on accumulation of adaptations, etc.); so all I could do was to find a vulnerable spot in the shaping of it, fire my little shot, and run away in the smoke.' (quoted in J. LENNOX, *The Darwin/Gray Correspondence*, p. 475).
[7] J. LENNOX, *The Darwin/Gray Correspondence*, p. 472-474.

euphemism of our ignorance of natural laws[8]. Among the various senses this word has come to take over history, these four are the most important regarding our topic.

The commonest use of 'chance' refers to an unexpected, unplanned turn of events – it is best rendered by 'luck'. It is also the oldest, proposed by Aristotle in the 5th century B.C.E. in the second book of his *Physics*. 'Lucky' events are not deprived of finality, but they happened in a course of events that had been thought with another aim in mind. Indeed, Aristotle differentiated between 'luck' and 'spontaneity', the former being only possible for beings capable of deliberation (that is, in his conception, adult human beings), an interesting nuance for today's debate (*Physics*, II, 6). The distinction is classically shown by the examples of a man meeting a debtor on his way to the market – a matter of luck or coincidence – and a rock falling on a bystander and killing him – a spontaneous event (*Physics*, II, 5-6). Authors like Jean Gayon class mutations in that category, considering that it is pure luck whether they are advantageous or detrimental with respect to the organism's environment[9]. In that perspective, chance is opposed to determinism, as in Darwin's opinion.

However, categorizing the selection of mutations as 'luck' is not entirely correct. In Aristotle's conception, as well as in today's, luck is always good or bad (*Physics* II, 5, 15); whereas mutations can also be neutral. A more fitting word would be 'coincidence', which is devoid of any implication of the sort. The impact mutations can have on an organism's adaptation to its environment is hence better characterized as being a matter of coincidence than of luck.

As Darwin had foreseen, in addition to their selection, the occurrence of mutations is also a chance event in evolutionary biology. This process has been described as accidental or random, two similar but not identical notions.

Aristotle's conception was rejuvenated in the 19th century by the French mathematician Augustin Cournot[10]. 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 of two or more independent causal chains – a definition that can be likened to Aristotle's. *A contrario*, following the shift of emphasis from final to efficient causes that occurred in the 16th century, Cournot did not

[8] J. LENNOX, *The Darwin/Gray Correspondence*, p. 459 and 465.
[9] J. GAYON, *Evolution et hasard*, p. 531.
[10] Ph. SENTIS, *La notion de hasard*, p. 487-488 ; Antoine-Augustin Cournot, in *Complete Dictionary of Scientific Biography* (2008).

make any reference to finality, even when conscious beings are involved, therefore rendering his theoretical construction more suitable to scientific methodology[11]. Nevertheless, a caveat regarding Cournot's proposition is its deterministic background – in agreement with his time, the mathematician believed every single event to be somehow determined. Quantic mechanics and Heisenberg's uncertainty principle have seen to the downfall of that framework.

Nonetheless, as indeterminism is insofar confined to restricted scientific fields[12], Cournot's definition is probably the most widely used in the scientific community – if not explicitly, at least through its straightforward application, statistics.

In biological research, 'random' is by default to be understood as 'statistically random', i.e. which does not, or at least should not, display any patterns or regularities that could be theorized by mathematical laws. Randomness is hence related to probability theory and the ability to predict events from laws deduced from initial conditions and repeated observations[13]. Probability laws characterize what arises from Cournot's theory of chance occurrences when the same independent series occur multiple times; this repetition can give rise to theoretical models and make randomness somewhat predictable[14]. While an accidental event can be of any kind, statistical randomness implies that even if the exact result of a process is unknown, it is part of a definite ensemble of possible outcomes. As such, deeming a single event 'random' implies it is part of a series of events, the rules of which it does not appear to follow[15]. A truly unique event can only be accidental.

Following that interpretation, the accidental aspect of the appearance of mutations would refer to the unpredictability of the occurrence of a given mutation in a given cell or at a given time. On the other hand, the list of possible mutations is not endless and their appearance has been repeatedly studied. Based on the vast amount of data collected over time and given several initial conditions, it is indeed possible to estimate mutation rates over time. If we go back to Darwin's opinions, the notion of 'accident' seems indeed more opposed to 'design' than to 'determinism'. Darwin did not consider probability as a means to predict variations;

[11] J.-M. MALDAMÉ, *Hasard et Providence*, p. 542.
[12] Although, according to some authors, mutations could sometimes be attributed to 'absolute randomness', that is, the indeterminism as defined by Heisenberg's uncertainty principle. Mutations can indeed be caused by electromagnetic interferences, which fall under the uncertainty principle. This idea is intriguing, but would lead us astray from biological conceptions. See M. DELSOL, *Hasard, ordre et finalité en biologie*, p. 31.
[13] J. GAYON, *Evolution et hasard*, p. 529 ; D. LAMBERT, *Le déterminisme du hasard* ; Ph. SENTIS, *La notion de hasard*, p. 476-478.
[14] R. PAYOT e.a., *Le hasard et la sélection expliquent-ils l'évolution ?*, p. 21.
[15] P. BYRNE, *Evolution, randomness and divine purpose*, p.658.

whether it would have been best contrasted to 'determinism' or to his strict conception of 'design' is uncertain.

Scientific randomness is related to an essential aspect of the role of chance in evolution. The very predictability of random events indeed infers that 'chance' can only yield certain results. At least in a scientific background, chance is always linked to a certain level of order – it can but influence the choice between the various possibilities offered by that order[16]. Pure chance does not exist – it is always determined to some extent by the structure within which it occurs[17]. In other words, it 'can only realize what the system upon which it acts is capable of'[18]. A single mutation could never transform a protozoan into a mammal, for instance. This means the breadth of action of chance in evolution is relatively limited as far as mutations and phenotypical variations are concerned.

If, by definition, an event can only be called random in comparison to the pattern shown by the series of occurrences it belongs to, then the scientific understanding of randomness also implies that what can be deemed as a chance event depends on the system used as a referential. This definition of chance can be called, as does Jean Gayon, contingency to the theoretical system[19]. Gayon considers that occurrences can be fortuitous with respect to a certain theory if they cannot be predicted by that theory and distinguishes three possible causes: the insufficiency of empirical data, the complexity of required calculations and the theory itself[20]. In all cases, the intervention of chance is subjected to the time's comprehension of that theory; should it be updated that the fortuitous dimension could shift or even disappear. This notion of contingency can hence be related to what Darwin (and others before him) called our ignorance of the natural laws. Although it does not play a role *per se* in evolutionary processes, this description of 'chance' must be kept in mind, for it is a useful reminder of the fact that what 'chance' exactly entails can vary from one system to another – from one discipline to another.

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[16] M. DELSOL, *Hasard, ordre et finalité en biologie*, p. 33 ; M. DELSOL, *Le hasard dans la nature et son "sel" épistémologique dans les phylogenèses de l'évolution biologique*, p.433-434.
[17] D. LAMBERT, *Le déterminisme du hasard*, p. 524.
[18] R. PAYOT e.a., *Le hasard et la sélection expliquent-ils l'évolution ?*, p. 21, personal translation.
[19] J. GAYON, *Evolution et hasard*, p. 529-530.
[20] Regarding the inability of a theory to predict specific data, J. GAYON gives as example the value of the gravitational constant *g*, which is not fixed in Galileo's theory but must be empirically calculated. Heisenberg's uncertainty principle would be another illustration. Other authors, like P. BYRNE, consider that absolute randomness is a claim that goes beyond the scientific field, as it implies that such an event is random regarding all existing series it could be part of (*Evolution, randomness and divine purpose*, p. 658).

All three meanings of chance we have detailed – coincidence, accident and randomness – are essential to a correct understanding of evolutionary theories and a proper articulation of evolution with a philosophical or theological comprehension of nature. Let us now turn to the latter and the notion of 'design'.

C. Divine design and the philosophical concept of finality

The theological notion of 'design' is encompassed within the larger concept of divine action in the world – i.e. creation and providence[21]. The current comprehension of 'creation' is two-folded: it refers, of course, to the making of the universe by God, but it also includes the continuous involvement of God in His world to maintain it. Creation, hence, occurs both at the beginning (*creatio in principio*) and over time (*creatio continua*). Divine design is understood as transpiring through each act of creation, including that of living beings, which are given an idiosyncratic finality – a particular end to reach (see below).

The second aspect of divine action – providence – corresponds to how God governs His creation towards His ends[22]. 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'[23]. Although God's care for His people is related in multiple passages in both Testaments, the idea of 'providence' is not exposed on its own, and the word is not even biblical in origin – it was coined by Greek philosophers as referring to the cosmic order of the universe. The concept was especially developed by Stoics, who considered that this divine order guided the world toward beauty and harmony and added a strong anthropocentrism to the doctrine.

The extent and manner of divine interventions in history have been heatedly debated over centuries, notably regarding its 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 amount to one's own salvation in a pretemporally foreordained universe – have been in the spotlight of Catholic and Protestant discussions since the 16th century. Although tangent to our topic, this particular issue sheds an interesting light on divine providence in nature – as no eternal life is at stake, the formulation

[21] B. BOURGINE, *Le miracle dans la théologie fondamentale classique*, p. 507 ; M. KEHL, *'Et Dieu vit que cela était bon'*, p. 26-33.
[22] G. AULETTA, *Providence*, p. 1145.
[23] R. BERNHARDT, *Providence*, p. 403.

of the scope of divine actions on non-sentient beings has indeed been deemed less pressing and not nearly as much discussed. In our case, it is notably worth noting that John Calvin highlighted so much God's omnipotence that 'even raindrops are under his control'[24]. This certainly seems to be the kind of divine design that Darwin had in mind when he discussed the topic with Asa Gray. As mentioned in the beginning of the introduction, Darwin's incomprehension and rebuke of God's apparent authorization of evil, suffering and death in nature as being incompatible with His benevolent will was nothing new in theology, and the proper articulation of divine providence and the existence of evil – a concern referred to as theodicy – has been disputed at length over the centuries as well[25]. That God has a salvific plan – design – for this world and specifically for mankind is beyond certain for theologians of all sides, but how far that design goes is still open to discussion.

On the other hand, the concept of design is related to, and sometimes confused with, the notion of finality. Finality itself is a complex idea, whose understanding fluctuates according to the philosophical system it is integrated in. Given its use in historical science/religion conflicts, the very word is also deeply mistrusted by most scientists. It is hence important to review the different meanings it could take.

A very large definition of finality could be ascribed to a purposeful action – that is, in Aristotle's and Thomas Aquinas' words, when an agent acts towards an end[26]. Although this definition could include processes driven by inanimate objects, the issue of finality has usually been restricted to living agents and concomitant to the question of their awareness of their own ends. The latter has allowed for the distinction between human beings and the rest of nature – between 'voluntary' agents, who are cognizant of their own ends, and 'natural' agents, who are not. Finality hence differs from deliberation: not only do natural agents not act upon it, but sometimes voluntary agents do not either – when they act upon instinct or habit, for instance[27]. Finality, on the other hand, is ubiquitous: all actions, be it consciously or not, are always carried out toward an end. A voluntary agent will act in order to perform the conscious representation of his purpose, whereas a natural agent will act in order to achieve what its nature commands. In other words,

[24] R. BERNHARDT, *Providence*, p. 403. See J. CALVIN, *The Institutes of Christian Religion* I, 16, 5: 'It is certain that not a drop of rain falls without the express command of God'.
[25] G. AULETTA, *Providence*, p. 1148.
[26] J. MCEVOY, *Le primat de la cause finale chez S. Thomas*, p.98. This leads to the distinction between final and efficient causes.
[27] J. MCEVOY, *Le primat de la cause finale chez S. Thomas*, p. 102.

> a seed contains a resemblance of what it will be in its fully developed state, and the adult of a given species has in itself the resemblance of the novel individual it will produce, but the vital effort to grow and reproduce presents in that respect no element of choice or will, because the tendency and exertion of the individual are here unconscious (*sine intelligentia, sine intellectu*)[28].

In that perspective, there is finality in animal (and plant) actions because they transform their actions into means to an end, even without knowing so[29].

Here comes an essential difference between Aristotle's and Thomas' theories of finality. Whereas Aristotle stopped at that comprehension, Thomas the theologian introduced divine design. His reasoning is based on natural observations: animals and plants are perfectly shaped and organized one for another; but they are insentient, so they cannot be at the root of that perfection; so it must be the result of the careful planning of some higher being – i.e. God[30]. In Thomas' vision, finality is intimately linked with divine design and doubly reflects God's creating action, as it refers both to a given being's place in the divine plan for nature and to what this being can achieve depending on what God provided it with as inner resemblance.

Aquinas had obviously no idea of genes, mutations and phenotypic variations, but had he known about them, he would probably have seen divine design in evolutionary laws rather than at the mutation level. That was at least the option chosen by the International Theological Commission in a document released in 2004 called *Communion and stewardship*, which, among others, focuses on catholic positions on current scientific debates and on which we will come back at the end of this section[31].

Finality without design, to use the expression of François Bonsack[32], can relatively easily be accepted in biology circles. In Bonsack's model, 'broad finality occurs when causes are determined so that the effect answers to certain conditions'[33]. Natural selection is a perfect example for him, where conditions are the offspring's best survival, causes the parents and means the reproduction of the fittest individuals, a mechanism that is automatically ensured by the fact that the fittest individuals succeed best in reproduction. Natural selection acts on means, which determine the causes (that is, which individual gets to reproduce) relatively to

[28] J. MCEVOY, *Le primat de la cause finale chez S. Thomas*, p. 105, personal translation.
[29] J. MCEVOY, *The teleological perspective upon nature*, p. 4.
[30] J. MCEVOY, *Le primat de la cause finale chez S. Thomas*, p. 110-111.
[31] The document is available in English on the Vatican website.
[32] F. BONSACK, *Finalité et biologie*, p. 105-114.
[33] F. BONSACK, *Finalité et biologie*, p. 105.

the condition (viability) that the effect (the offspring) must comply with. No external or internal design is involved here[34].

As a matter of fact, natural selection seems to be the only example. For Bonsack, all other cases fall into the category of finality with design: 'narrow finality occurs when causes are determined so that the effect answers to certain arbitrarily fixed conditions, which are called design. The mode of existence of design is the one of a representation'[35]. Design, here, could be likened to the internal representation an agent had of his own end in Thomas Aquinas' framework – although apparently not to a natural agent's resemblance. However, Bonsack's understanding of 'arbitrarily' as 'contrarily to what would spontaneously happen' twists the meaning of 'design', and it would appear as if, in his mind, there is no evidence of design in evolution because it all seems to occur following natural laws. To prove the presence of design (and a designer) is possible only through showing that evolution would have taken another path had natural selection not been meddled with – a near impossible feat[36].

Regardless of his rather unique conception of design, Bonsack's distinction between finality with and without design is highly interesting to our purpose. Indeed, in addition to tolerating finalistic terminology, it allows biologists to work in a finalistic model without dragging in any notion of external design – that is, it is possible to word one's research interests as looking for answers to whys in addition to hows while conserving a strictly mechanistic methodology. Bonsack is also remarkable is his analysis that scientific mistrust in finality is related to the attempts to transform this methodology into finalism – i.e. the philosophical option according to which every event is determined by its purposes (or final causes)[37].

It must be noted, though, that even if finalistic questions may be asked, finalism can never be a proper scientific methodology, at least following the current criterion as proponed by Karl Popper – empirical falsification. Finalistic explanations can answer basically every question by 'it is so because it is the best for this purpose' or, in a religious perspective, by 'it is so because God wanted it for His purpose' – but neither claim can be tested on scientific grounds[38]. An example can be found in the so-called anthropic principle: trying to understand why physical constants took a specific value is akin to asking why life is possible, but can be

[34] F. BONSACK, *Finalité et biologie*, p. 107.
[35] F. BONSACK, *Finalité et biologie*, p. 110, personal translation.
[36] F. BONSACK, *Finalité et biologie*, p. 113.
[37] F. BONSACK, *Finalité et biologie*, p. 113.
[38] Cl. TROISFONTAINES, *La réhabilitation des formes et de la finalité chez Leibniz*, p 171. See also Ph. CLAYTON, *Natural Law and Divine Action*, p. 633.

searched for in theoretical and practical physics, whereas comprehending this 'principle' as an obligation for the universe to make place for life is definitely not[39].

On another hand, finality has also been defined as opposed to a peculiar comprehension of 'chance' – Cournot's theory: 'it can be said that finality is the opposite of chance because it results from the meeting of interdependent causal series'[40]. In this vision, finality seems to be intrinsically paired with design, as conscious will is interpreted to be the link between two causal chains. Finality is consequently banned from the scientific world: 'in order to explain the world, we, as scientists, have no need for any kind of finality'[41]. At most a mere appearance of finality in nature can be tolerated as a token of peace with our tendency to rely on anthropomorphisms – but it is no more than a 'pseudo-finality'[42].

Regardless of all the explanations above, finality is nowadays mainly understood as going hand in hand with design. The issue of the existence of an end toward which nature would roll therefore confounds itself with that of a designer who would be behind evolution. Although the idea of design, once properly distinguished from finality, is quite simple on its own, its application to evolution is not. Theologically speaking, its understanding indeed impacts on one's broad comprehension of the actions of God on nature and henceforth of God Himself.

An example can be found in the position proposed by the International Theological Commission in the aforementioned document *Communion and stewardship*. It is established on the well-known understanding of God as *causa causarum* instead of a natural cause that could be reached through scientific experiments. The Commission notes that the actual level of chance or design (or purposiveness) in evolutionary processes is a matter of science and 'cannot be settled by theology' (69). Design is to be understood as God's plan for nature, of which evolution is part, and not as His actual pre-ordainment of every single variation to ever occur. As such, chance and divine design are not exactly opposed – because chance events can only happen out of chance if God allowed it – i.e. if He designed chance to be the core process behind evolution.

[39] See for instance D. LAMBERT, *Conditions anthropiques, finalité et création*, p. 429-452.
[40] R. PAYOT e.a., *Le hasard et la sélection expliquent-ils l'évolution ?*, p. 22, personal translation ; see also M. DELSOL, *Le hasard dans la nature*, p. 435-437.
[41] R. PAYOT e.a., *Le hasard et la sélection expliquent-ils l'évolution ?*, p. 23, personal translation.
[42] Ph. SENTIS, *La notion de hasard*, p. 493-494.

D. Research strategy

The Commission's vision definitely differs from what Darwin understood of divine design, but also, more widely, of God and His willingness to let beings suffer and die. It is quite obvious, from the Commission's emphasis on these concepts, that the proper understanding of chance, finality and divine design and providence is crucial to its acceptance of evolution as a biological process entirely compatible to Christian beliefs. Quite unexpectedly, the Commission even scolds explicitly 'many neo-Darwinian scientists, as well as some of their critics' for their 'misunderstanding of the nature of divine causality' (69). The utmost importance of the exact comprehension of all notions at stake is clearly established, as well as the detrimental consequences to science/religion relations a hazy understanding could create.

This is particularly true for the tenants of a strict incompatibility of science and religion regarding evolution – be those scientists or theologians, materialists or creationists. Therefore, theirs will be the first positions we shall focus on in our quest to a better understanding of science/theology debates over evolution, and we will examine their understanding of chance and design and its impact on their doctrines. Afterwards, we will turn to another school of thought, fairly new but broadly accepted – Intelligent Design; we will study the evidence it brings to prove the world has been planned and analyze its arguments on scientific, philosophical and theological levels. Finally, we will investigate theologies of evolution, a different sort of framework that discusses chance and design at length and elaborates a cooperation of science and theology similar to the International Theological Commission's. Due to practical constraints, we will restrict ourselves to the Anglo-American sphere, where the science/theology discussions are mostly pursued.

All three standpoints dominate current debates and propose distinct science/religion relations – akin to mutual exclusion, fusion and articulation, respectively. Therefore, delving into their arguments will give us a wide, though of course not exhaustive, prospect of today's disputes. We will hence survey the theories of their main representatives: biologist Ariel Roth and the Institute for Creation Research for creationism, biologist Richard Dawkins and philosopher Daniel Dennett for materialism, philosopher William Dembski and biochemist Michael Behe for Intelligent Design, and Catholic theologian John Haught for a theology of evolution. Evaluating and confronting these positions will allow us to draw conclusions on what whether chance and divine design are indeed opposed in evolutionary theory and how positive relationships can be built based on an accurate and reciprocal understanding.

II. Mutual exclusion: scientific creationism and scientific materialism

Let us first begin by two schools of thought that, though radically opposed to one another, rely both on the importance of chance in evolutionary theory to develop their position regarding evolution and its cognate theological implications.

A. Scientific creationism

1. Birth and rise of creation science

Creationism commonly refers today to the rejection of the very idea of evolution as opposed to the account of divine creation explained in Genesis, and to such a degree goes on par with a literal understanding of Scripture[43]. Interestingly, this was not the case at Darwin's time, as geological findings about the age of the Earth and 'higher' (or historical) criticism had already led most scholars to dismiss such a literal reading. As a matter of fact, the issue laid not so much with evolution as it did with natural selection. When the *Origin of species* was published, evolution was indeed no recent idea by any account – Lamarck's treatises advocating his evolutionary theory dated back to the years 1800, to mention but one well-known scholar – and had been, more or less grudgingly, accepted by most theologians as a possible means of divine creation[44]. On the contrary, 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 that assumption was not even made by Darwin himself at the time, it was understood accordingly by Reverend Charles Hodge, an influential Presbyterian theologian from Princeton Theological Seminary[45]. This is highly relevant to our present study, as the current debate around evolution is still set in Hodge's terms. In his book *What is Darwinism?*,

[43] As mentioned in the introduction, this work will focus on the Anglo-American positions. We will hence not discuss creationism outside of Christianity, although it of course exists in other religions. For neutral reviews of the history of science and religion relationships in America, see D. LINDBERG and R. NUMBERS (eds), *God and Nature*; E. SCOTT, *Evolution vs Creationism*; D. LECOURT, *L'Amérique entre la Bible et Darwin*; Th. LEPELTIER, *Darwin hérétique*; P. CLAVIER, *Qu'est-ce que le créationnisme ?*.

[44] I. BARBOUR, *Religion and Science*, p. 82.

[45] F. GREGORY, *The Impact of Darwinian Evolution on Protestant Theology in the Nineteenth Century*, p. 375-377.

published in 1874, Hodge formalized the main three 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 is exactly what Hodge reproached him – his providing an intellectual system that could stand on its own without God, or without any kind of purpose at all. The theologian considered evolution to be entirely ruled by chance and completely incompatible with a God-driven process; atheistic in essence, Darwinism had therefore to be fought with tooth and nail, for it posed a threat to the whole Christian faith[46]. Furthermore, Hodge attacked Darwin for stepping outside scientific boundaries: in his mind, design, which branded 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[47].

It must be noted that not all theologians agreed with the Presbyterian's conclusions. An opposite position was hold for instance by another Princeton theologian (though from the separate institution of Princeton College), James McCosh, who deemed not only evolution but even natural selection to be compatible with divine action: natural selection – natural laws – could very well be the product of a supernatural design. McCosh's understanding was rejected, quite expectedly, by Hodge, but also by Darwin: external interventions were to play no role in evolution [48]. After Hodge, few theologians claimed such moderate assessments of natural selection, and the debate over evolution settled down for about half a century, until American fundamentalists took the matter in hand in the 1920s.

Anti-evolutionism had never been much of an interest to fundamentalists before – evolution is barely mentioned in *The Fundamentals*, which were published between 1910 and 1915[49]. Their virulent rejection appeared when they began seeing Darwinism as the major source of unbelief among American youth and of social degeneration in general, and was epitomized in the Scopes trial (or 'monkey trial') in 1925. Albeit opposed to evolution for religious reasons, fundamentalists laid their battle on scientific grounds – that is, they professed evolutionary theory was no true science, but was an interpretation of facts, a mere hypothesis, against which their own, scientific, explanations stood stronger. Said explanations were, of course,

[46] 'Religion has to fight for its life against a large class of scientific men', quoted by F. GREGORY, *The Impact of Darwinian Evolution on Protestant Theology in the Nineteenth Century*, p. 385.
[47] His acceptance of evolution itself was enough to land him next to Darwin and Galileo in the Creation Museum of Petersburg, Kentucky, USA, founded by the creationist institution Answers in Genesis (see J. BYASSEE, *Dinosaurs in the Garden* and http://creationmuseum.org/).
[48] F. GREGORY, *The Impact of Darwinian Evolution on Protestant Theology in the Nineteenth Century*, p. 380.
[49] For this paragraph, please see R. NUMBERS, *The Creationists*, p. 391-403.

true to the Genesis account of creation. However, although it was their common, uniting element, fundamentalists – creationists – diverged on its very comprehension, mostly of the days of creation. These could indeed be taken strictly as a 24h-period or could be interpreted as eons of time, a view that could accommodate geological findings about an old Earth. Moreover, the number of creations was disputed – the creation related in Genesis could be the first and only one, or there could be others, whose products were destroyed by God before He created Adam, in which case fossils were easily explainable as remnants of previous creations. William Jennings Bryan – the famous lawyer who took on the creationist case in the Scopes trial – was a 'progressive' creationist, who admitted in court that the Earth was more than 6,000 years old. The self-taught geologist whose works he quoted in his pleas, George McCready Price, was on the other hand a 'strict' creationist, never wavering from his belief in a young Earth and attempting to disprove all geological findings in favor of an old Earth by the occurrence of a one-time worldwide Flood, as described in Genesis[50].

2. Scientific creationism: evolution as unscientific and incompatible with Christianity

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 the ideologies mentioned above, we will focus now on one of them, the strictest and probably most widespread of all – strict creationism or 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 forming qualified creationist biologists and geologists; we will examine the positions of one of its former presidents, prolific writer and biologist Ariel R. Roth, who moved the Institute to Loma Linda, California, and has been tirelessly advocating flood geology for decades. On the other hand, YEC emergence owed also much to Henri Morris, an engineer who also followed on McCready Price's footsteps and published his 'evidence' of the young age of the Earth in *The Genesis Flood* in 1961. Attempting to further improve its scientific credentials, Morris and his partners dubbed the resurgent movement 'scientific creationism' and later founded the Institute for Creation Research (ICR) in Dallas, Texas,

[50] For information, the Flood plays a central, albeit curious, role in creation science, which dates back to George McCready Price. It is among others tantamount to explain the various geological strata all over the world, but also the progression of fossils among them (the animals were actually trying to get away from the rising waters) and even the slight issue of all current dating methods such ^{14}carbon or argon/potassium ageing the Earth far more than 6,000 years (in addition to their inherent flaws, these techniques are rendered useless by the Flood, which disturbed rocks so much that their initial amount of the utilized isotopes cannot be calculated). The ICR gives comprehensive information on that topic; see also J. FLORI and H. RASOLOFOMASOANDRO, *Evolution ou Création?* and A. ROTH, *Origines. Au carrefour entre la Bible et la science*.

whose regular members must hold a scientific degree of some sort[51]. The positions defended by the ICR go beyond evolution and touch every scientific discipline concerned with the origin of Earth and of mankind; they can be summarized 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[52].

These elements characterize creation science from its beginning to its current form, both in the publications of the ICR and of Ariel Roth[53]. Among those expressly dedicated to evolution, the argument of the logical impossibility of chance clearly stands apart. As Hodge once did, it is intricately interwoven with the rejection of evolution as science, which is central to their 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. While many attempt to keep a foot in each camp, acknowledging Christ as Savior yet holding evolution to be a fact of history, Christianity and evolution cannot both be true. Evolution is, at its very essence, an atheistic explanation of the world around us. […]
>
> These two concepts, supernatural design versus natural processes operating by chance, represent the two views of origins, and are opposite. […]
>
> 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. It is a potential answer to the question, "What happened in the unobserved past to make the present get to be this way?" As we have seen, this answer encompasses far more than merely a scientific proposal. As currently understood by leading evolutionists, it embraces strict naturalism, an anti-God philosophy, and results in a denial of the major doctrines of Scripture[54].

Evolution is incompatible with Christianity because its process is wholly driven by chance, including natural selection. That particular standpoint is in direct opposition to evolutionary

[51] The ICR has, of course, a website: www.icr.org. See also R. NUMBERS, *The Creationists*, p. 407-413.

[52] These form a 1981 Arkansas statute concerning the teaching of creationism and evolution at school, quoted by R. NUMBERS in his 1992 book *The Creationists*, himself quoted in J. GRANT, *Discarded Science*, p. 179.

[53] See also M. RUSE, *Scientific Creationism*, p. 257-265, for a detailed yet concise presentation of these elements; J. FLORI and H. RASOLOFOMASOANDRO, *Evolution ou Création?* and especially A. ROTH, *Origines. Au carrefour entre la Bible et la science*, for more complete explanations.

[54] J. MORRIS, *"Natural" Selection versus "Supernatural" Design*, an article posted on the ICR website by its current president.

theory, in which, although mutations can be labelled as random, natural selection definitely does not, as we shall see in the next section. Aware of that, the ICR 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, namely 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'[55]. 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[56]. This vagueness conveniently allows them not to consider the fact that, as already mentioned, scientific randomness regarding mutations is certainly not synonymous with pure indeterminism, and decidedly not chaos[57]. Nonetheless, there is one exception to this conscious ambiguity: 'chance' can indeed be understood in its statistical meaning, as related to probability laws, but apparently only when applied to evolution as a global process. Flashing values coming out of unknown calculations but aiming to prove that life or DNA could never have occurred by chance, creationists often argue, indeed, that would the generation of design by chance not be a logical impossibility, it would still be such a statistical improbability that it would be near 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, he can be sure this complexity was *designed.* […] Without a living God to create life, the laws of probability and complexity prove beyond doubt that life could never come into existence at all[58].

Order and design, on the other hand, serve as near-synonyms when they refer to the inner organization of organisms or of ecological systems, although design can also stand for the

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[55] R. GULIUZZA, *Natural Selection Is Not "Nature's Intelligence"*.

[56] This last term leads to an unexpected argument against evolution: it cannot happen because it stands contrary to the second law of thermodynamics, which states that the entropy of a closed system can only increase over time – in other words, a system can only go from order towards disorder. However, a random evolutionary process is the exact opposite, as it claims that order (or complexity, or design) comes out from disorder (or less complexity, or chaos). No scientific hypothesis could ever go against the most fundamental laws of physics – Q.E.D. See H. MORRIS, *Does Entropy Contradict Evolution ?* and *Can Order Come Out of Chaos*.

[57] Ph. KITCHER calls it the 'randomness ploy'. See his excellent refutation of YEC arguments (including those of probability, thermodynamics, the Flood and its 'consequences' on fossils and dating methods, and micro/macroevolution) in his book *Abusing Science. The Case Against Creationism*.

[58] H. MORRIS, *Probability and Order versus Evolution*.

'divine plan' behind creation, thusly signifying both the blueprint and the intention of the person in charge[59]. 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. No amount of power or energy is enough to bring order out of chaos. […] These processes don't happen randomly but are divinely caused by God. God is the Author and Organizer of orderliness. His design and construction of our own bodies, through the complexity of biogenesis, is a proper reason for glorifying and thanking Him for making us[60].

Designed by God, the universe follows its foreseen destiny, towards its predetermined finality – fulfilling God's purpose: 'God designed humanity to enjoy the happiness of stability, the happiness of productivity, and the happiness of success'[61]. Consequently, God would never have abandoned mankind nor any living being to such a 'heartless' process as evolution: 'the omnipotent God of Creation is thus the ever-sustaining and ever-caring God of providence'[62], not even forgetting the inanimate world in His love. The purposelessness of evolution advocated by Darwin and his followers is as contradictory to the Christian perspective as is 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. […] These teachings [about evolution] are hardly neutral, but rather openly teach religion – the religion of atheism and nihilism.'[63] Darwinism is clearly the root of all evils found in contemporary Western societies – ranging from corruption and scandal to teenage suicide through 'debauchery and hedonism'[64]. 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 knowing is that this random, undirected, purposeless, naturalistic, atheistic and unscientific evolution is utterly unacceptable.

In complete disregard of Darwin's early answer, creationists make ample use of the old argument of design; William Paley himself and his *Natural Theology* (1809) are often quoted.

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[59] We owe this useful distinction to P. MCLAUGHLIN, *Reverend Paley's naturalist revival*, p. 29.
[60] ICR, *God Caused Order*.
[61] ICR, *God Caused Meaning*.
[62] H. MORRIS, *God's Work of Providence*.
[63] J. BERGMAN, *Darwinism: Survival without Purpose*.
[64] ICR, *God Caused Meaning*; F. SHERWIN, *Created for a Purpose*.

Although it is now paired by the ICR to the statistical improbability of design ever rising out of chance, the core of the argument is unchanged – 'design in living things is obvious', with 'a favorite example of obvious design always [being] the human eye'[65]. No positive evidence for such an improbability is offered – design always appears by default[66]. Such is the case, for instance, for the human mind and its abilities, to which Ariel Roth devotes a whole separate demonstration; although their evolutionary origins are still unclear, avowedly due to our rudimentary knowledge of their functioning and the recent uptake of their study by scientists, he concludes that these abilities simultaneously offer as many challenges to any naturalistic explanations, and subsequently 'suggest that men result from the design of an infinitely superior being and that they do not descent from animals through a purely mechanistic evolutionary process'[67]. This impossibility is only thrust forward as a closing argument: it is impossible to think so, hence it is impossible to be so; in other words, creationists' mindset is no different from Hodge's, who 'simply could not admit that his position, a belief based on an assumption, *could* be replaced by its opposite'[68].

This is an important element, as it means that creation science, for all its efforts, is no more scientific than parapsychology. Although scientists are practicing science on an everyday basis, philosophers of science have never been quite able to reach a consensus on the criteria required to brand hypotheses or results as scientific, notably regarding more 'historical' sciences like paleontology, where no direct experiment is readily available[69]. As creationists themselves are wont to remind their audience, the well-known philosopher of science Karl Popper characterized scientific hypotheses as being falsifiable, a criterion allegedly unmet by evolutionary theory: 'evolution is neither observable nor repeatable nor predictable as taking place in the present'[70]. Indirect evidence, on the other hand, is obtainable – in our case, evolutionary theory is staunchly supported by convergent results from different, testable branches of science. Nevertheless, even this criticism can somehow be answered, as shown by this sentence attributed to geneticist J.B.S. Haldane, who was being asked what would prove evolutionary theory wrong: 'fossil rabbits in the Precambrian'. Rabbits appeared much, much

[65] J. MORRIS, *"Natural" Selection versus "Supernatural" Design*.
[66] In that perspective, their use of this argument is highly similar to this of the supporters of the Intelligent Design movement, as we shall note in the next section, although, once again, the literalist premises differ.
[67] A. ROTH, *Origines. Au Carrefour de la Bible et de la Science*, p. 127, personal translation.
[68] F. GREGORY, *The Impact of Darwinian Evolution on Protestant Theology in the Nineteenth Century*, p. 376, emphasis original.
[69] See e.g. a summary of the Ruse/Laudan debate about scientific criteria in Th. LEPELTIER, *Darwin hérétique*, p. 194-202.
[70] H. MORRIS, *Finding an Evolutionist's God*. This article is some kind of a review on Christian biologist Kenneth MILLER's book *Finding Darwin's God*.

later than the Precambrian era, and such fossils would indeed shed some serious doubt on evolution, but this has yet to happen[71].

As already noted in the introduction regarding finalistic theories, the argument from design, on the other hand, cannot be falsified. An example can be found in the human eye, whose complexity has always been used by creationists as a proof of design, as abovementioned. As a matter of fact, the eye is far from perfect, as the light has to travel through the entire eye and the successive cell layers of the retina in order to reach sensitive photoreceptors. To evolutionists, such suboptimal structure would support rather a mechanistic evolutionary process, rather than a design from a supernatural, omniscient being[72]. Nevertheless, creationists, such as A. Roth, have turned around their argument, now asking why a continuous process like evolution would not have corrected its previous mistake[73]. Creationists are of course entitled to their own comprehension of chance and design in evolution, but their scientific grounding is inexistent or false.

It must henceforth absolutely be noted that none of the arguments presented above have ever been founded on scientific experiments, nor have been published in any peer-reviewed journal. They rely solely on re-interpretations of facts that have been made part of and elucidated by evolutionary theory. Carefully quoting known evolutionists to pit them against each other, continuously adopting a scientific vocabulary, skillfully casting doubts on scientific methods and current paradigms, they do, nonetheless, look very science-y to the untrained eye, probably explaining why 'scientific' creationists have been so successful in their relentless opposition to evolution[74].

B. Scientific materialism

Taking scientifically-based claims going beyond the boundaries of science is also deemed a hallmark of scientific materialism or, more broadly, scientism. As for creationism, what a scholar exactly refers to when he brings in the notion of 'scientism' is variable. One of the commonest meanings could be

> The belief that science, especially natural science, is much the most valuable part of human learning – much the most valuable part because it is the most authoritative, or

[71] It is among others quoted in R. DAWKINS, *The Illusion of Design*.
[72] See e.g. Richard DAWKINS, *Natural 'Knowledge' and Natural 'Design'*.
[73] A. ROTH, *Origines. Au Carrefour de la Bible et de la Science*, p. 109-110.
[74] A. ROTH's book *Origines. Au Carrefour de la Bible et de la Science* is an excellent, and quite terrifying, example.

> serious, or beneficial. Other beliefs related to this one may be regarded as scientistic, e.g. the belief that science is the *only* valuable part of human learning, or the view that it is always good for subjects that do not belong to science to be placed on a scientific footing[75].

Michael Stenmark gives a very useful classification of all the different types of scientism in his 1997 article *What is scientism?* He first discriminates between *academic-internal* and *academic-external scientism*; the former considers that all disciplines could be reduced to 'proper science', that is, natural sciences (or even a particular science within these), while the latter concerns the whole of society and can be further subdivided into several classes. His distinctions are worth being quoted at length for our topic:

> We identified *epistemic scientism* (the view that the only reality that we can know anything about is the one science has access to), *rationalistic scientism* (the view that we are rationally entitled to believe only what can be scientifically proven or what is scientifically knowable), *ontological scientism* (the view that the only reality that exists is the one science has access to), and *redemptive scientism* (the view that science alone is sufficient for dealing with our existential questions or for creating a world view by which we could live). Further, two forms of *axiological scientism* were distinguished. The first claiming that science is the only truly valuable realm of human life, the second that science can completely explain morality and replace traditional ethics[76].

These forms of scientism can of course be combined; Stenmark calls the widest combination *comprehensive scientism*, which 'claims that science alone can and will eventually solve all, or almost all, of our genuine problems.'[77] In this categorization, not all types of scientism are essentially atheistic – epistemic scientism does not imply that no reality at all exists beyond what can be reached by science, and even ontological scientism is compatible with some trends of theism. Moreover, they do not necessarily equate to scientific materialism or scientific naturalism, if these are to be understood as subscribing to two specific 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')[78]. Scientific materialism is consequently atheistic by nature and draws its conclusions about the inexistence of deities from its scientific knowledge – wherein lies the scientistic fallacy, to use Gregory Peterson's expression[79]. Scientific materialism is actually an interpretation of scientism transcending all of Stenmark's categories, and two

[75] T. SORELL, *Scientism: philosophy and the infatuation with science*, p. 1.
[76] M. STENMARK, *What is Scientism ?*, p. 31.
[77] M. STENMARK, *What is Scientism ?* , idem.
[78] Both are quotations from I. BARBOUR, *Religion and Science*, p. 78. See also I. BARBOUR, *Taking Science Seriously Without Scientism;* M. STENMARK, *What is Scientism ?*, p. 24.
[79] G. PETERSON, *Demarcation and the Scientistic Fallacy*.

prominent figures of the creation/evolution debate are proud self-proclaimed ambassadors of that transversal materialism: philosopher Daniel Dennett and biologist Richard Dawkins. We will now elaborate on their understanding of chance and design and its reflections on their theological opinions.

1. Richard Dawkins: natural selection at the heart of evolution

As already hinted at, the exact importance of chance in the evolutionary process is still inchoate, a situation mostly related to the place dedicated to natural selection. This debate has been personified by Richard Dawkins, who is probably one of the most orthodox representatives of Neo-Darwinism (that is, very succinctly put, Darwinian intuitions plus biochemistry and genetics), and by paleontologist Stephen J. Gould[80]. Whereas Dawkins gratifies nonrandom, rationally understandable, law-like natural selection with 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; consequently, if evolution were to happen again, it would never produce the same outcome. This downplay of natural selection had unsurprisingly delighted opponents of evolution of all sorts. However divergent emphases they may give to evolution (and however waspishly they expressed it), Dawkins and Gould do not, on the other hand, differ on its core – random mutations selected by nonrandom natural selection through the level of adaptation to the current environment (or fitness) they provided, with the additional accidental occurrences of unexpected major environmental changes. Chance is on that account 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 about chance – Jacques Monod's opus *On Chance and Necessity* published in 1970 in French and translated in English in 1971. 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'[81]. This 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

[80] G. PETERSON, *Whose evolution? Which theology?*; K. STERELNY, *Darwin vs Gould*. Despite his death in 2002, Gould's positions are still influential (and controversial) today.
[81] J. MONOD, *On Chance and Necessity*, quoted by I. BARBOUR, *Religion and Science*, p. 80.

chance's products, but was actually following a rigorous necessity[82]. 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 what kind of chance and necessity he had in mind regarding evolution, although his few mentions of probability laws point at least to a possible statistical meaning of chance[83]. Nonetheless, Monod expressed in his book the common standpoint of Neo-Darwinians from his time and later on.

Indeed, Dawkins's perspective on evolution and natural selection was exposed in his first two books, *The Selfish Gene* (1976) and *The Extended Phenotype* (1982), which are but a decade posterior to Monod's *On Chance and Necessity*. Dawkins presented the idea, new at the time but broadly accepted today, that evolution primarily happens at the genetic level: genes are the evolutionary vectors and we, the organisms, are but their vehicles, necessary for them to be replicated and perpetuated over time. Genes do not care about their vehicles once they have been passed on – hence their 'selfishness'; evolution is thereupon viewed as 'a war between gene lineages'[84] where the battlefield is the environment, the weapons are the organisms' phenotypes[85], and the prize is winning the favor of natural selection – being transmitted. The role of natural selection and the importance of chance in evolution have, however, been more expanded in *The Blind Watchmaker* (1986), where Dawkins broached views he still holds today and which he presents in several articles on the website of his foundation – the Foundation for Reason and Science[86] – and on his one of his latest books, *The God Delusion* (2006). As the title of this opus and the aim of his Foundation ('Innovating for a Secular World') plainly state, Dawkins links his comprehension of chance and design to his atheism.

In complete agreement with Neo-Darwinian theory, Dawkins 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

[82] J. MONOD, *Le hasard et la nécessité*, p. 135.
[83] See a criticism e.g. in E. SCHOFFENIELS, *L'anti-hasard*.
[84] K. STERELNY, *Dawkins vs Gould*, p. 9. See p. 7-10 and 131-133 for a good summary of Dawkins' perspective. Gould also argued with Dawkins on that point, considering that natural selection operates on the organisms, not on the genes, which are 'invisible' to it; the unit of selection is thus not the gene, but the individual, or even the group. The extent of group selection is still under discussion today. See K. STERELNY, *Dawkins vs Gould*, p. 10-13 and 133-134 for a summary of Gould's opinion.
[85] The phenotype of an organism is its morphology, physiology and behavior, as opposed to its genotype, which is the ensemble of genes it carries.
[86] richarddawkins.net.

widespread, ludicrous misconception that natural selection itself is a random process'[87]. On the contrary, 'the achievement of nonrandom natural selection is to tame chance'[88]: every bit of chance happening at the mutation level is filtered by natural selection through the change in fitness mutations bring to the organism[89]. As Dawkins puts it, natural selection is how environmental information is integrated into an organism's genome – how an organism adapts to its changing milieu. Furthermore, natural selection (and thus evolution) is a cumulative process: it operates at 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 renders it somehow 'directed' as only 'good' genes are selected (that is, genes that are 'good at building bodies that survive to reproduce in the environment of the species'[90]) and answers for its non-randomness.

This tackles the argument of improbability of creationists: 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 much on chance would not be scientific at all; but as a matter of fact, they do not, so the argument is void.

> By smearing out the luck, breaking down the improbability into a large number of small steps – each one somewhat improbable but not ridiculously so – natural selection ratchets up the improbability. As the generations unfold, ratcheting takes the cumulative improbability up to levels that – in the absence of the ratcheting – would exceed all sensible credence[91].

Rather paradoxically, Dawkins seems to share his comprehension of design with creationists, as his use of this notion to characterize the order observed in organisms and in nature always implies the existence and the deliberation of a designer – of God; his rejection of design is hence always coupled with a repudiation of God.

Simultaneously to the argument of improbability, Dawkins destroys the argument from design, which is barely an argument in his mind: 'such-and-such looks designed, therefore it was designed'[92]. He rather disdainfully christens it 'the Argument of Personal Incredulity'[93] –

[87] R. DAWKINS, *Natural 'Knowledge' and Natural 'Design'*.
[88] R. DAWKINS, *The Illusion of Design*.
[89] R. DAWKINS, *L'horloger aveugle*, p. 332. The whole chapter 3 is dedicated to demonstrating the non-randomness of cumulative natural selection.
[90] R. DAWKINS, *Natural 'Knowledge' and Natural 'Design'*.
[91] R. DAWKINS, *The Illusion of Design*.
[92] R. DAWKINS, *The Illusion of Design*.
[93] R. DAWKINS, *L'horloger aveugle*, p. 56.

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 skeptics, but it is not even an argument *per se*: Dawkins likens it to the sheer incredulity one can show when faced with an impressive magic trick – yes, it might look devoid of all possible rational explanations to our puny mind, but that does not mean it actually is. Nobody would pay attention to someone believing in the reality of a magic trick only because he couldn't think of any other way the magician would have performed it; so why would it be any more acceptable regarding evolution?[94] Moreover, pointing towards current gaps in a theory does not disprove it (especially knowing that science needs time to provide answers), and in any case does not make any alternative theory true by default[95] - such a reasoning is also applied to the argument of the 'gaps' in fossil records and will come back regarding the Intelligent Design. Notwithstanding, the 'illusion of design', to use Dawkins' own wording, is easily justified by the cumulative selection of mutations towards an ever-better adapted organism.

> The illusion of design depends upon the gradual accumulation of small improvements, escalating to levels of complexity and elegance that could not conceivably be achieved in a single lucky step. We are rightly incredulous of any suggestion that biological complexity could spring suddenly from primordial simplicity in one generation. But it is easy if each step of a gradual progression is derived from its immediate predecessor which it closely resembles. That, in a phrase, is why evolution can so brilliantly explain life, where neither chance nor design can[96].

As we can see, Dawkins refutes the popular dichotomy between chance and design also emphasized by creationists: of course chance cannot explain life, but evolution is not a chance process, and the opposition accordingly lies between evolution (or natural selection rather) and design – the latter not being a rational option at all in his mind.

Dawkins dwells longer on the concept of random mutations in *The Blind Watchmaker*[97]. If randomness is understood as pure indeterminism – as it is by most creationists – then there are several ways according to which mutations are, as a matter of fact, not random at all. First, they never appear spontaneously, but are caused by different physico-chemical or biological mechanisms, such as UV rays or mistakes of the enzymes in charge of replicating DNA during cellular division. Second, some genes are more prone to being mutated than others.

[94] Richard DAWKINS, *Pour en finir avec Dieu*, p. 166-167.
[95] R. DAWKINS, *Pour en finir avec Dieu*, p. 163-164.
[96] R. DAWKINS, *Natural 'Knowledge' and Natural 'Design'*.
[97] R. DAWKINS, *L'horloger aveugle*, p. 353-362.

Third, the distribution of mutations along the genome is not even, as 'hot spots' exist where mutations are more likely to happen. In that sense, mutations are not purely random, as they are influenced by external, environmental factors as well as their chromosomal localization. Dawkins adds in a fourth 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 are then mutations portrayed as bringing chance in the evolutionary process? Because they are random relatively to the change of fitness 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' system, mutations themselves are not fully random (although they follow probability laws as construed in the introduction), while their effects on fitness (what is really important from the perspective of natural selection) 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. He is strongly opposed to the conception of the 'ladder of life' with mankind on top and to the global 'layering' of the animal kingdom: 'Certainly that interpretation of progress [between different phyla] is just a logical error. Evolution is a branching tree and that's all there is to it'.[98] He is, however, not adverse to see 'progress' in the sense of a better adaptation of descendants relatively to their ancestors within a lineage:

> To the extent that adaptation is to the a-biotic environment (such as the weather), you would expect no progress. Evolutionary change would simply track the weather. […] To the extent that adaptations are to the biotic environment (that is, other organisms, rather than natural conditions), then it seems to me quite plausible that there is in fact a progressive arms race as I term it. The better a predator gets at running down prey, the more it pays the prey to shift resources into anti-predator adaptations and out of other aspects of life. There are always trade-offs in the economy of life[99].

This specific application of progress cannot, however, be applied to mankind. Dawkins explicitly refuses any extension of evolutionary theory to ethics: 'the study of evolution is not in the business of justifying anything' – and signally not any kind of 'social Darwinism' or related movements:

[98] F. MIELE, *An Interview with Richard Dawkins*. Dawkins has in several occasions indicated he disagreed with the 'speciesism' displayed by human beings, and is a staunch supporter of the *Great Ape Project*, whose aim is to expand human rights to great apes. See e.g. R. DAWKINS, *L'horloger aveugle*, p. 306.
[99] F. MIELE, *An Interview with Richard Dawkins*.

> I would oppose any suggestion from any group such as the National Front [a British far-right and racist political movement], that whatever occurs in natural selection is therefore morally good or desirable. We come back to this point over and over again. I'm definitely not one who thinks that "is" is the same as "ought."[100]

Dawkins' comprehension of 'divine design' appears close to Darwin's, who, as we have already mentioned in the introduction, saw God's hand behind every life event. Similarly, Dawkins takes the example of predators and preys – of cheetahs and antelopes, to be precise – and, after candidly admiring how perfectly designed they are to achieve their goals (respectively kill and flee) asks why a benevolent being would create species that are so finely crafted to maximize the death of each other (respectively by eating them or reducing them to starvation). Even if the argument of design was true, the idea of God it would lead to would be disturbing, to say the least. What purpose would there be behind all these 'blood sports'?[101]

Logically, Dawkins himself sees no purpose at all in the universe: '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'[102]. As a matter of fact, he seems to fall prey to his own Argument of Personal Incredulity: as no purpose has ever been detected so far through empirical means – as no purpose can be imagined for our world – it is devoid of existence. Dawkins goes further than concluding to evolution's purposelessness from scientific data; he transforms this absence of results into a positive affirmation (a not so scientific process) 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[103].

He nevertheless does not conclude that human life has neither meaning nor purpose in itself, warning against 'nihilism at a personal level': 'you can have a very happy and fulfilled personal life even if you think that the universe at large is a tale told by an idiot'[104]. Beyond that, the only kind of purpose or finality one could find would be metaphorical, as evolution is not deliberate, and concerns the race towards increased fitness of organisms. There is no need for supreme designs, purposes or providences – and indeed, in Dawkins' mind, they do not exist.

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[100] F. MIELE, *An Interview with Richard Dawkins*.
[101] R. DAWKINS, *A River Out of Eden*, p. 105.
[102] R. DAWKINS, *A River Out of Eden*, p. 133.
[103] See M. STENMARK, *Evolution, Purpose and God* for a discussion of this argument.
[104] F. MIELE, *An Interview with Richard Dawkins*.

2. Daniel Dennett: natural selection as an algorithm

Daniel Dennett gives 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 to be an algorithmic process, a qualification that will be 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 (the power of the procedure is a result of its logical structure, not the materials that happen to be used in carrying in out […]), underlying mindlessness (although the overall design of the procedure may be brilliant, or may yield brilliant results, each constituent step is utterly simple. […]), guaranteed results (whatever an algorithm does, it always does it, provided the algorithm is executed without misstep. An algorithm is a foolproof recipe.)[105]

Dennett directs the readers to the implementation of this definition by Alan Turing and his computational machines, which were – are – able to perform perfect arithmetic without having the slightest idea about it. To him, this is exactly where lies 'Darwin's 'strange inversion of reasoning'': in order to achieve something complex, there is no need to know how, as long as the process can be broken into small, simple, mindless steps[106]. This definition does indeed look similar to Dawkins' explanation of natural selection.

One might object that algorithm-using machines like computers are created with an intelligent supervision – they are designed by man. Must it be deduced that natural selection has been designed as well? The answer to this question is a resounding 'no': 'who designed that cascade [of algorithmic processes feeding on chance producing the biosphere]? Nobody. It is itself the product of a blind, algorithmic process'[107]. If anything, the evolutionary algorithm appeared concomitantly to and is the outcome of the emergence of life, when unicellular organisms first thrived to survive in their environment. Furthermore, Dennett adds that the impossibility to reduce processes using chance at some point to algorithms is a popular misconception; on the contrary, inasmuch as algorithms often make use of randomness, such a dichotomy would be utter nonsense[108].

[105] D. DENNETT, *Darwin's Dangerous Idea*, in *The Sciences*. This article is made up of excerpts from the eponym book, in which natural selection as an algorithmic is developed p. 48-60. Future references of *Darwin's Dangerous Idea* will be extracted from this book.
[106] D. DENNETT, *Darwin's 'strange inversion of reasoning'*.
[107] D. DENNETT, *Darwin's Dangerous Idea*, p. 59.
[108] D. DENNETT, *Darwin's Dangerous Idea*, p. 52.

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 artifact. 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[109].

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.[110]

Natural selection as an algorithm is ordered and creates design in a Neo-Darwinian sense – a good adaptation to one's environment. Design does not equate novelty nor even complexity – mathematical theorems are no less designed because they look simpler, often the contrary[111].

Design, for Dennett, does thus not suppose any designer, but only 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 only mentions that 'there is no fixed agreement among evolutionary theorists about this'[112]: while some absolutely refuse any design-related word, others accept to speak of functions of organs as 'purposes', and others again simply remain uncertain. 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 doesn't think highly of the argument of design, which is no more than a petition of principle about 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[113]. 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*

[109] D. DENNETT, *Darwin's Dangerous Idea*, p. 64.
[110] D. DENNETT, *Darwin's Dangerous Idea*, p. 65.
[111] D. DENNETT, *Darwin's Dangerous Idea*, p.141; see also p. 127.
[112] D. DENNETT, *Darwin's Dangerous Idea*, p.141; see also p. 126.
[113] D. DENNETT, *Darwin's Dangerous Idea*, p. 66; see also p. 28-33.

definition of the optimal solution to a certain issue[114]. Few of us have ever considered the human appendix to be designed, for instance, because to the best of our knowledge it serves few uses, if any; the complex eye of an eagle, on the other hand, is likelier to appear designed because it meets the requirement of an extraordinary vision necessary to spot tiny prey from above. Consequently, the argument of design is even weaker, if not completely nullified.

As expected, the random part of evolution arises in mutations (although unpredictable catastrophes are also acknowledged)[115]. Dennett readily notes the 'marriage of chance and necessity [as] the hallmark of biological regularities'[116], 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[117]. Quite surprisingly for a philosopher, Dennett rarely discriminates randomness from chance, accident and luck; in some circumstances, it 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' and Dennett's visions of evolution are quite similar: a mindless, purposeless, but nonrandom process that selects random mutations through their phenotypical effects. Their exact definition of design or purpose slightly differs, 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 those premises, though, that they reject religion, Dawkins much more radically than Dennett. As briefly mentioned, the traditional issue of pain and evil is also at stake, as well as their comprehension of evolution as explaining morality and religion is also an important factor – God is a product of our minds, an outcome of evolution[118]. Dawkins subsequently takes delight into returning the argument of improbability against its supporters: if a complex structure like the eye is so improbable, how much more improbable an infinitely complex being such as a deity must be! The complete implausibility of its existence makes creationists the first victims of this argument[119].

[114] D. DENNETT, *Darwin's Dangerous Idea*, p. 130-133.
[115] D. DENNETT, *Darwin's Dangerous Idea*, p. 299-312, where chance is defined as unpredictability.
[116] D. DENNETT, *Darwin's Dangerous Idea*, p.129.
[117] D. DENNETT, *Darwin's Dangerous Idea*, p.355, 323 and 59, respectively.
[118] M. GERS, *Memes vs God: Dennett and Dawkins Take on Religion*.
[119] See e.g. R. DAWKINS, *The Illusion of Design*.

Although the role of chance in evolution clearly differs from creationists' and scientists' account, their comprehension of design and purpose as divine interventions is remarkably similar – only Daniel Dennett makes an effort to distinguish design from God's blueprint. Both movements stretch science further than it can go. What does differentiate creationists from scientific materialists like Dawkins and Dennett, however, is that their scientific premises are, at least in the current state of science, but probably regardless, completely wrong.

III. Evolution is not enough: Intelligent Design Theory

Over the decades following Darwin's publication of the *Origin of Species*, his intuition about evolution was progressively confirmed by an ever-accumulating mountain of evidence coming from all branches of science, including the newly-born genetics and biochemistry. When Julian Huxley, renowned biologist and – incidentally – grandson of 'Darwin's bulldog' Thomas H. Huxley – published his own master opus *Evolutionary: The Modern Synthesis* in 1942, he could rightfully claim the complete victory of what would be called Neo-Darwinian synthesis – evolution, as a whole, appeared unassailable.

However immense the leaps in comprehension achieved during the first half of the 20th century, evolution, like every scientific theory, left many questions unanswered, and the exact mechanisms were still open to discussion. Two topics were of particular importance to our matter of interest. The first was, of course, the possibility that such a complex world could arise from gradual selection of random mutations; Gould's insistence on mass extinctions as a crucial factor and his reluctance to see gradualism as the main evolutionary agent have already been mentioned, and he wasn't alone in criticizing this aspect of Neo-Darwinism on a scientific basis. The second issue was a corollary of Darwin's theory, the appearance of life from inorganic molecules – a process called abiogenesis or biopoiesis – and it was much debated for similar probabilistic reasons; physicist Fred Hoyle's opposition, for instance, was based on his statistical calculations about the (im)probability of abiogenesis on Earth, while biologist Francis Crick's reservations came from the unlikelihood of complex protein interactions networks observed in early organisms emerging in the relatively short time span between Earth became hospitable to life and the appearance of these organisms. Both separately proposed in the 1960s and 1970s models where life originated from outer space, although Francis Crick later reconsidered his position when new data arose[120]. No more than Gould were they led by their objections to reject Darwinism nor to invoke any religious agent as a possible reply (as a matter of fact, both were and remained atheists), although that didn't prevent creationists from turning their arguments against evolutionary theory.

[120]Th. LEPELTIER, *Darwin hérétique*, p. 207-209. The main issue was to propose a solution to the chicken-egg enigma posed by the DNA-RNA-protein dogma, where DNA was required to make proteins and conversely. The discovery of the enzymatic activity of RNA – meaning that it could lead to DNA, RNA and proteins – open entirely new perspectives on the pre-biotic world. See L. ORGEL and F. CRICK, *Anticipating an RNA World.*

A. Intelligent Design: political aims and religious premises

Although not under that name, Intelligent Design Theory (IDT) first emerged in this skeptical context with the publication in 1985 of the explicitly titled *Evolution: A Theory in Crisis*, where biochemist Michael Denton expressed his dissatisfaction with Neo-Darwinism. Considering evolution no more confirmed by solid evidence than in Darwin's time, Denton returned to the old distinction between microevolution (modification within a species) and macroevolution (transformation a species into another). While he validated the former, he objected that the lack of transitional fossil forms showed that the latter was uncertain at best, and that using evidence from microevolution to support macroevolution was unscientific – that it was a good example of auto-persuasion. Although based on recent biochemical examples, his idea was no new argument *per se* – microevolution had already been broadly accepted at Darwin's time, contrarily to macroevolution, as previously noted – as Denton was rapidly reminded of by evolutionists[121]. Denton did not propose any religious answer and made no reference to the Bible or creationism, but his book was immediately praised by creationist institutions such as the ICR and Answers in Genesis – although Denton himself always opposed creationism[122]. Albeit the idea of design behind evolution was not prominent at the time, it was later expanded on in Denton' second opus *Nature's Destiny: How the Laws of Biology Reveal Purpose in the Universe* (1998). *A Theory in Crisis* profoundly influenced influential ID theorists Phillip E. Johnson and Michael Behe[123].

Quasi simultaneously to Denton's *A Theory in Crisis*, the second founding opus of the movement, *The Mystery of Life's Origin: Reassessing Current Theories,* was published in 1984 by chemist Charles Thaxton, engineer Walter Bradley and geochemist Roger L. Olsen. Published in 1984, this book focuses on the second critical point of Neo-Darwinism – abiogenesis – and argued that the issue was completely unsolvable: life could not have emerged given the Earth' initial conditions and the current scientific laws. According to Thaxton and his two co-authors, that left scientists with only a handful of options: physical or chemical laws needed to be redrafted; life came from outer space (which only displaced the problem); life on Earth was a creation of another form of intelligent life (most likely not carbon-based, unlike ours); life had been designed by a supernatural being. The first three hypotheses had been more or less already proposed by other scientists like Hoyle or Crick; the

[121] Th. LEPELTIER, *Darwin hérétique*, p. 213-215.
[122] J. OLLER, *A Theory in Crisis*, and ANSWERS IN GENESIS, *Blown Away by Design, Michael Denton and Bird's Lungs*.
[123] See on Denton's page on the Discovery Institute website.

last one, however, was leaping into religious grounds, which was not accepted by the scientific community[124]. Regardless, this option became Thaxton's choice of preference, which he defended, among others, by renewing Paley's argument of design: inferring design and a designer from complexity is not unscientific at all – after all, that is exactly the kind of evidence scientists scanning the cosmos for signs of extra-terrestrial intelligent life are looking for. From an epistemic perspective, the attribution of complex structures on Mars to aliens and on Earth to a supra-intelligent being is no different. Why would the latter be unscientific?[125] From the origin of life, Thaxton expanded his views to evolution, and supervised the publication of a high-school textbook written by two biologists, Percival Davis and Dean H. Kenyon, *Of Pandas and People: The Central Questions of Biological Origins* (1989), which was published by the Foundation for Thought and Ethics (FTE), a Christian, nationalist and anti-evolutionist institution based in Texas. *Of Pandas and People*, where the expression 'Intelligent Design' was coined, yielded relatively quiet reactions, until it was brought to light by Phillip E. Johnson, who popularized the term in his 1991 book *Darwin on Trial*.

Darwin on Trial marks the real beginning of ID as a well-organized movement, at a scientific, philosophical and political level. A professor of law at Berkeley University and a born-again Christian, Johnson's faraway interest in evolution, which he at first believed to be God's way of creating and maintain the world, was renewed upon his successive reading of Dawkins' *The Blind Watchmaker* and Denton's *Evolution: A Theory in Crisis*. Denton won: henceforward convinced of the inadequacy and the ontological materialism of Neo-Darwinism[126], Johnson launched all his honed skills in his newly-found battle. '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 new approach, as he himself later explained in an interview in 2002, relating the cascade of events that had led, a decade earlier, to the publication of *Darwin on Trial*:

> I then got to know the people from the mainstream community and the creationist world who are critical of Darwinism. What I brought to the dissident movement—Nancy Pearcey [another ID theorist] has pointed this out—was a sense of strategy.

[124] Th. LEPELTIER, *Darwin hérétique*, p. 215-218.
[125] Thaxton refers to the SETI program (Search for Extra-Terrestrial Intelligence), which consists in listening to space in hopes to detect radio messages from outer space (which have yet to come). For his perspective on science/metaphysics boundary, see Ch. THAXTON, *In Pursuit of Intelligent Causes*.
[126] In Johnson's words: 'In short, my discovery that the reasoning in Darwinism is unscientific, illogical, and dishonest was tremendously important to me because it validates that "In the beginning was the Word" is really the correct starting point'. See J. KUSHINER, *Berkeley's Radical: An Interview with Phillip Johnson*.

> People were caught in a rationalist mentality. They were thinking, "If we present facts and evidence, Stephen J. Gould will say, 'Oh yes, you're right and I'm wrong,'" and then the scientists would let them in. Well, I understand a little bit better how that world works, and I thought of it like a political campaign or big case litigation.
>
> So the question is: "How to win?" That's when I began to develop what you now see full-fledged in the "wedge" strategy: "Stick with the most important thing"—the mechanism and the building up of information. Get the Bible and the Book of Genesis out of the debate because you do not want to raise the so-called Bible-science dichotomy. Phrase the argument in such a way that you can get it heard in the secular academy and in a way that tends to unify the religious dissenters. That means concentrating on, "Do you need a Creator to do the creating, or can nature do it on its own?" and refusing to get sidetracked onto other issues, which people are always trying to do. They'll ask, "What do you think of Noah's flood?" or something like that. Never bite on such questions because they'll lead you into a trackless wasteland and you'll never get out of it[127].

Although expressed in a more politically correct fashion, this official 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'[128]. Most of the early critics of Neo-Darwinism are still active members of the CSC – Thaxton, Bradley and Pearcey are both CSC fellows, Denton and Behe Senior Fellows, while Johnson, who had to reduce his professional activities due to health reasons, is now its program advisor. 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 movement similar to the one experienced by creationism half a century ago – is only the first step of the long-term strategy of the CSC and the DI, as exposed in the *Wedge document*[129], a manifest written by the DI directors in 1998 and which was divulged a year later, forcing the CSC to acknowledge the link between IDT and the broad aim of the DI – reinstalling Christianity at the center of the political, social and academic life of the United States. Regarding scientific matters, 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

[127] J. KUSHINER, *Berkeley's Radical: An Interview with Phillip Johnson*.
[128] Page dedicated to Stephen Meyer on the DI website.
[129] The *Wedge document* is still available on the website it was first exposed on.

> materialistic conception of a self-existent, self-organizing universe and the Darwinian view that life developed through a blind and purposeless process[130].

As detailed on the CSC website, 'defending free enquiry' goes through supporting 'research by scientist and other scholars challenging various aspects of Neo-Darwinian theory [and/or] developing the scientific theory known as intelligent design'[131]. The relation between IDT and politics, although constantly downplayed by the CSC members – it is no conspiracy if everyone is aware of its existence, after all, and not only was it disclosed by Johnson in his 2002 book *The Wedge of Truth*, but CSC fellow Mark Hartwig dedicates it a whole website, *The Wedge Update* – is still present. Like creationists before them, ID theorists claimed that ID, as a scientific theory, must be taught in high school biology classes; like them, they strived to implement it through federal law and failed[132]; like them, the issue was settled down in court when a high school board in Dover endorsed *Of Pandas and People* as an official textbook in 2004. The subsequent trial in 2005 led to the rebuttal of ID as science and hence to its banishment from classes as 'alternative theory'[133]. Although this had certainly delayed the long-term strategy of the CSC, the Dover trial has not marked the end of ID[134].

B. Intelligent Design: between theistic evolution and scientific creationism

A final and essential aspect of the ID movement is that ID theorists have always taken great care to differentiate ID from creationism (in all its forms), but also from theistic evolution. The latter is treated with barely concealed disdain by mathematician and philosopher William Dembski, one of today's most prominent ID theorists and Senior Fellow of the CSC:

> 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. What theistic evolution does is take the Darwinian picture of the biological world and baptize it, identifying this picture with the way God created life. When boiled down to its scientific content, theistic evolution is no different from atheistic evolution, accepting as it does only purposeless, naturalistic, material processes for the origin and development of life. […] Design theorists find the "theism" in theistic evolution superfluous. Theistic evolution at best includes God as an unnecessary rider in an otherwise purely naturalistic account of life[135].

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[130] DI, *About Discovery Institute*.
[131] DI, *About The Center For Science And Culture*.
[132] That proposition was made in 2001 by Senator Rick Santorum (hence its name of Santorum Amendment), who, incidentally, was one of the Republican candidates for the 2008 presidential elections. The Santorum Amendment was actually adopted by the Senate, but not by the House, and hence never became a law.
[133] The 139 pages long judgment of Judge E. Jones III also sums up the debate about ID being scientific.
[134] S. BATHIJA, *Creationism's Evolving Strategy*.
[135] W. DEMBSKI, *What Every Theologian Should Know About Creation, Evolution and Design*. See also a more detailed explanation in his book *Intelligent Design: The Bridge between Science and Theology*, p. 109-114.

Dembski's position is shared by Phillip Johnson, who, when asked whether ID theorists had tried to debate with theistic evolutionists, blandly replied: 'We've tried many times, but I've found that they are even harder to reason with than the atheistic evolutionists. I've been able to get along with the atheistic evolutionists better. It's disappointing.'[136]

Ironically, ID theorists are at the receiving end of the exact same reproach – giving too much away to science – by creationists: although they recognize it as a valiant attempt to put design back at its rightful place, creationists consider that ID suffers from the same fate as evolutionists – they don't take into account the Truth as revealed in the Bible[137]. Moreover, creationists unwillingly agree with Dawkins regarding the being who would have designed a world with so much suffering and death: if unexplained by the original sin and the Fall, its attitude can only be charted as cruelness, certainly not benevolence[138]. The ID movement is doomed to failure, because it negates its very biblical foundation.

Of course, ID theorists use the same argument backwards – creationism is based on the Bible, which is unscientific; since ID is not, it can be classified as science:

> Creationism typically starts with a religious text and tries to see how the findings of science can be reconciled to it. Intelligent design starts with the empirical evidence of nature and seeks to ascertain what inferences can be drawn from that evidence. Unlike creationism, the scientific theory of intelligent design does not claim that modern biology can identify whether the intelligent cause detected through science is supernatural[139].

Furthermore, the very acceptance of evolution by ID theorists is an argument by itself – as we shall see, neither Dembski nor Behe – today's major ID scientific backup – claim to reject evolution *per se*:

> Design theory places no limits on the amount of evolutionary change that organisms might have experienced in the course of natural history. Consistent with classical views of creation, design allows for the abrupt emergence of new forms of life. At the same time design is also consistent with the gradual formation of new forms of life from old. The design theorists' beef is not with evolutionary change per se, but with the claim by Darwinists that all such change is driven by purely naturalistic processes which are devoid of purpose[140].

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[136] J. KUSHINER, *Berkeley's Radical: An Interview with Phillip Johnson*.
[137] H. MORRIS, *Design is not enough !*, and *Intelligent Design and/or scientific creationism*.
[138] H. MORRIS, *Insufficient design*. Morris uses the same word as Dawkins to refer to such a Designer – sadistic.
[139] http://www.intelligentdesign.org/whatisid.php, consulted on January 11, 2013. This website is directly related to these of the CSC and the DI.
[140] W. DEMBSKI, *What Every Theologian Should Know*; M. BEHE, *Intelligent Design Is Not Creationism*.

The antagonism between ID theorists and creationists is not entirely unsurprising, given the initial enthusiasm of the ICR for IDT, and how the ID movement was at first openly creationist – it is well known that the first edition of *Of Pandas and People* explicitly referred to creationism, and that, after an 1987 judgment forbidding the teaching of creation science, all occurrences of 'creationism' and related words were changed to 'intelligent design' and cognate expressions, with one unfortunate exception which became 'cdesign proponentsists'[141].

It would be erroneous, though, to fully oppose the CSC and creationists today. IDT is not a wholly unified movement; even if some ID proponents are theists, like Behe, others are open creationists, be it in a Young Earth (e.g. Nancey Pearcey) or an Old Earth (Stephen Meyer, the co-founder and current vice-president of the CSC) movement[142]. Even Dembski, who wrote the abovementioned quote, sees himself 'firmly on the side of traditional creationists' as opposed to 'evolutionary creationist', 'a biblical inerrantist, accepting the full verbal inspiration of the Bible and the conventional authorship of the books of the Bible', including that humans descend from Adam and Eve and certainly not primates (although he elsewhere claimed that he 'could be comfortable with common descent that can be squared with Christian tradition'[143]) and 'would be a young-earth creationist in a heartbeat' but for scientific evidence of an older Earth[144]. ID theorists and creationists might be at odds regarding their arguments against Neo-Darwinism, but they appear to be theologically closer than one might think.

This – admittedly not too brief – depiction of IDT is, we believe, essential to understand its importance in the current American society and why it is so harshly fought by the scientific community. It also allows us to underline the metaphysical premises of IDT, which, from what we have assessed, is far from the purely scientific theory it claims to be:

> Is intelligent design a scientific theory?

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[141] http://ncse.com/creationism/legal/cdesign-proponentsists, consulted on January 18, 2013. See the judgment of the Dover trial, p. 8 and 30-35. This 'cdesign proponentsists' will ironically be called 'the missing link' between creationism and ID.

[142] See respectively M. BEHE, *Irreducible Complexity. Obstacle to Darwinian Evolution*, p. 358; the judgment of the Dover trial, p. 32; William DEMBSKI, *What Every Theologian Should Know*.

[143] R. FLIESTRA, *William Dembski and John Haught Spar on Intelligent Design*. Dembski acknowledges that he is 'often called an anti-evolutionist' and states that 'the issue is that common descent, or common ancestry, has been tied to the Darwinian mechanism. That mechanism is supposed to drive the whole of evolution'.

[144] W. DEMBSKI, *Old Earth Creationism and the Fall. A Summary of* The End of Christianity, p. 2-3. Dembski published *The End of Christianity* in 2009.

> 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[145].

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

C. Tenets of Intelligent Design

What Behe called 'the theoretical foundation'[146] 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). In the latter, which was aimed at a broader and less mathematically-trained public, Dembski introduced intelligent design as 'the cure' to the 'disease' plaguing the scientific community: naturalism[147]. Quoting Monod, Dembski claims that 'chance and necessity have proven too thin an explanatory soup on which to nourish a robust science'[148]; by stubbornly refusing to acknowledge their inadequacy and accept design as a scientific hypothesis, scientists are only showing their unwillingness to leave their naturalistic mindset – i.e. their dogmatism. Moreover, by considering science as the only way to knowledge, they are themselves disproving the favored distinction between methodological and metaphysical naturalism: for Dembski, the former, which 'asks us for the sake of science to pretend that nature is self-sufficient' is just 'the functional equivalent of a full-blown metaphysical naturalism', which 'asserts that nature is self-sufficient'[149]. This is the reason behind the rejection of IDT by the scientific community: not only is it mutually exclusive with their current evolutionary paradigm, but it shakes their metaphysical worldview to its very core. Design will never be accepted by naturalistic scientists; but then, if they are true scientists, they will accept

[145] http://www.intelligentdesign.org/whatisid.php, consulted on January 11, 2013.
[146] In his foreword of the 2002 edition of W. DEMBSKI, *Intelligent Design*, p. 12.
[147] W. DEMBSKI, *Intelligent Design*, p. 120.
[148] W. DEMBSKI, *Intelligent Design*, p. 125.
[149] W. DEMBSKI, *Intelligent Design*, p. 119.

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'[150].

1. William Dembski, design and chance

In order to achieve that in a scientific way, an objective criterion to recognize 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. When intelligent agents act, they leave behind a characteristic trademark or signature. The scholastics used to refer to the 'vestiges in creation'. The Latin *vestigium* means footprint. It was thought that God, though not directly present to our senses, had nonetheless left his 'footprints' throughout creation. Hugh Ross has referred to the 'fingerprint of God' [the title of the first book of this astronomer and Old Earth creationist]. 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. But note, to say that an intelligent agent caused something is not to prescribe how an intelligent agent caused it. In particular, design in this last sense is separate from miracle[151].

Dembski usually uses *design* in its second meaning; however, he 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. The references to the vestiges of creation and to miracles are to be linked to the first part of *Intelligent Design*, from which these definitions are quoted: Dembski indeed begins by explaining at length how our ancestors were capable of 'recognizing the divine finger' (which is the title of the first chapter) by quoting biblical episodes (e.g. Pharaoh in front of the miracles performed by Moses and Aaron), then proceeds to handle miracles and to dismiss their critiques from modern philosophers because of their naturalistic perspective, which precluded them from perceiving any divine action in our everyday world. Though the word itself is not used, Dembski's concept of providence underlies the whole development; limiting God's action to the establishment of natural laws is described as 'a strictly logical possibility' that 'must always remain but one of several live

[150] W. DEMBSKI, *Intelligent Design*, p. 120.
[151] W. DEMBSKI, *Intelligent Design*, p. 127, italics in original.

metaphysical options'[152]. Dembski's preference inclines toward a broader notion of providence – God intervenes when He pleases and is not required to follow any kind of law. The extent of divine action within natural laws is not discussed in those chapters, but will covertly appear when Dembski elaborates his core theory of CSI in the consecutive section. 'The demise of British natural theology' (the following chapter) was directly caused by the acceptance of materialism, and therefore it is time to deal with 'naturalism and its cure' and 'reinsta[te] design within science' – the chapter we are currently reading from, where he details his scientific and objective design-detecting method – preparing for the very neatly delivered conclusion that Creation is God's gift and that 'the book of nature' must be taken along with 'the book of Scripture' to know who God is and to praise Him accordingly[153].

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 does not depend only on physical laws governing the movement of objects)[154] or that a process has multiple alternate possibilities (e.g. communication channels could not convey information if they only admitted one signal state (e.g. 0), but they accept several possible states, and the sending of any of them is featured as contingent)[155]. It 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 patters. Once a pattern is added that the object no longer violates but rather conforms to, the object suddenly becomes nonrandom'[156]. This definition, however, is somewhat confused by what immediately follows: when asking the subsequent question of the criteria by which we recognize an event as random (since there could always be a pattern it violates), Dembski answered by using 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'[157]. This is a common misconception

[152] W. DEMBSKI, *Intelligent Design*, p. 66.
[153] W. DEMBSKI, *Intelligent Design*, p. 235.
[154] W. DEMBSKI, *Intelligent Design*, p. 128-130.
[155] W. DEMBSKI, *Intelligent Design*, p. 153-154.
[156] W. DEMBKSI, *The Logical Underpinning of Intelligent Design*, p. 312. See also W. DEMBSKI, *Randomness by Design*.
[157] W. DEMBSKI, *The Logical Underpinning of Intelligent Design*, p. 313. The patterns used as examples are the classical head/tail coin tosses (HTTTHTHTHHTTHHHT versus HHHHHHHHTTTTTTTT).

called the gambler's fallacy, and Dembski, as a mathematician, must be well aware of it (and will indeed introduce specification to correct it, as we shall shortly detail). Why then appeal to our instincts? A possibility would be to induce his readers to subconsciously look for design where statistics speak of randomness[158]. Chance, in this case, seems to be understood as 'luck' or 'coincidence', in its most anti-deterministic way.

2. William Dembski's complexity-specification criterion (CSI)

Codifying this instinctive, unscientific comprehension is at the heart of his method, which he christened 'complexity-specification criterion' or 'explanatory filter'. Explicitly using Thaxton's core example of the SETI program, Dembski notes that three traits must indeed be simultaneously refuted to prove design: 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'[159]. Contingency means that the object was not produced out of necessity, i.e. 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 probable. Specification is slightly trickier. Dembski considers that the presence of patterns – of complexity – is not enough to infer design; he is fully aware that patterns can be found about anywhere if one looks hard enough. In order to avoid that, expected patterns in statistics (or in any branch of science) must be drawn 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 around his arrow afterwards, the target – the pattern – is dependent on the arrow's trajectory; conversely, if he shoots right into the pre-determined target, the event can only be attributed to his skill (provided it is sufficiently difficult to eliminate necessity and chance), i.e. to design. His shot is of course dependent on the target; Dembski hence writes that a pattern must be independent 'in a certain well-defined sense'[160]. If contingency alone is enough to dismiss necessity, a pattern needs be both complex and specified to reject chance, leaving design as the only explanatory option.

[158] P. CLAVIER, *Qu'est-ce que le créationnisme ?*, p. 88-89.
[159] W. DEMBSKI, *Intelligent Design*, p. 128. This chapter had already been published as a separate article under the title *Science and Design.*
[160] W. DEMBSKI, *Intelligent Design*, p. 133.

Any scientific experiment can yield false positives – when a result confirms the initial hypothesis while it should not – and false negatives – when a result fails to confirm a correct hypothesis; taking them into account is necessary when one's evaluating the reliability of one's experiment. Dembski first discusses false negatives; he is forced to acknowledge that they are inherent to any study of intelligent causes, simply because they can imitate chance and necessity and – mostly – because we must have prior knowledge of patterns in order to discern them. Dembski's reasoning appears rather circular – he detects design because he knows it exists – and mirrors what he himself chided 'naturalistic scientists' for – they refuse to see design because they assume there is none. Dembski disputes this argument as patterns are defined as independently specified – although how specification applies to natural phenomena is left unanswered[161]. Quite interestingly, he falls into this very trap when attempting to show that false negatives do not invalidate his criterion because we are dealing with an intelligent agent who aims at making himself visible – which is why the mimicking of chance and necessity is not a concern. Dembski never explains, however, how he could be so sure of the self-disclosing intention of this world's designer in an objective, scientific manner.

More important in his eyes is dealing with false positives – after all, missing designed structures is not so damaging to his criterion as finding design where it is not[162]. Dembski's explanations are not highly convincing. He first makes use of the argument of induction – every time we consciously use it, it works, so it ought to be more credited that it is (although he does not give any example) – before going back to his definition of his criterion: basing his explanation on the recognition of intelligence in laboratory animals (a rat's ability to immediately exit a complex maze after a period of learning), he asserts that 'intelligent agency always entails discrimination, choosing certain things, ruling others' (which is what the rat does) and that his criterion 'formalizes what we have been doing right along when we recognize intelligent agency' (the scientist eliminates chance in favor of learning – of the rat's intelligence – because of the complexity of the maze and because the exiting pattern he specified was followed by the rat)[163]. How exactly this means that his criterion does not yield false positives is left unclear (for information, the reliability of psychology studies on laboratory models is still controversial).

[161] W. DEMBSKI, *God's Use of Chance*, p. 249-250. This is a review of David Bartholomew's book *God, Chance and Purpose: Can God Have It Both Ways ?* published in 2008 and where he criticized IDT.
[162] W. DEMBSKI, *Intelligent Design*, p. 141.
[163] W. DEMBSKI, *Intelligent Design*, p. 144-146.

3. William Dembski's Law of Conservation of Information (LCI)

Having thus formalized CSI, Dembski carries on by proving information cannot be created by algorithms or natural laws: they 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 actualized 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 probability laws – could never generate information regarding the spatial position of scrabble pieces. On the other hand, chance is no good 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[164]. Information must have come from outside of the system – enter design. Albeit the Christian God and, as a corollary, the concept of providence, are never mentioned in the chapters devoted to CSI, Dembski's designer appears to intervene at every turn of natural history – whenever information must be created. How exactly this occurs – whether this nameless designer is to be found behind every single mutation, or whether he 'infuses' information in an organism and mutations are unrelated or a mere consequence – remains unclear.

Dembski's theorem is tidily written, but its weakness resides in its very foundation: Dembski's opposition of design, law and chance. As Michael Ruse puts it, 'of course one can define things as one will, and if one stipulates that design and law and chance are mutually exclusive, then so be it. But the downside is that one has now a stipulative definition and not necessarily a lexical definition, that is, one which accords to general use'[165]. First, like most people, Ruse sees no antagonism between law and chance, be it contingency or randomness – probability laws merge both. In common definitions, as given in the Introduction, contingency and randomness are even only imaginable in a context governed by laws – how could they be expressed outside of any structuring system? Contingency, in its common meaning, is not only producible but very much generated by law. Second, Dembski's contrast between design

[164] W. DEMBSKI, *Intelligent Design*, p. 170.
[165] Michael RUSE, *Darwin and Design: Does Evolution Have A Purpose?*, p. 323. See also *Can a Darwinian Be a Christian?*, p. 120-122 and *Darwinism and Its Discontents*, p. 282-284.

and chance is as forced. Dembski himself so concludes a presentation of his complexity-specification criterion:

> 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 (cf. necessities, regularities, and natural laws). 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[166].

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 IDT, the aspect of an object and a designer, Dembski's framework appears strikingly similar to creationists' and readily ignores all attempts from evolutionists to transform the issue from 'chance versus design' toward 'evolution versus design'. Such a parallelism with creationists is easily reinforced by the similarity of their vocabulary – the interdependency of information, complexity, order and probability as 'evidence' for design has already be mentioned in the previous section[167].

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) actualized by natural causes'[168]. Dembski's statements are 'at best, trivially true. They are nothing more than tautological statements'[169]. Furthermore, when applying his theory to evolution, Dembski specifically denies natural selection the ability to generate CSI, since natural selection cannot specify in advance its pattern: 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. But this relies on Dembski's characterization of his theory as holistic, which

> … is built directly into the definition of CSI. The independently given specifications that turn complex information into complex specified information are self-contained. […] CSI does not emerge by merely aggregating component parts. CSI is not

[166] W. DEMBSKI, *The Logical Underpinning of Intelligent Design*, p. 321.
[167] See e.g. H. MORRIS, *Probability and Order versus Evolution.*
[168] Howard J. VAN TILL, *Are Bacterial Flagella Intelligently Designed?*, p. 136.
[169] H. VAN TILL, *Are Bacterial Flagella Intelligently Designed?*, p. 136.

> 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[170].

That kind of definition is completely unsuitable for biological – or even chemical or physical – structures, especially in the context of evolutionary theory which, as we have seen, is thought to be a gradual process.

4. Michael Behe and irreducible complexity

Yet this very definition is central to Dembski's whole 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 then been reused by Dembski himself as a biological example – or scientific proof at the evolutionary level – of CSI[171]. 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*'[172] – a definition indeed well matched with CSI theory. Design is hence easily formalized: '*it is simply the purposeful arrangement of parts*'[173]. 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 poster 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; these come back in every article Behe's written on his theory, with the slightly more recent addition of the blood clotting cascade, which also requires a significant number of proteins to work out. In Behe's hypothesis, Darwin's black box refers to the eye – the complex organ whose formation he found himself unable to justify by small, gradual steps – and even though it has been opened, scientists are nowhere nearer a complete explanation of vision, much less of its evolution.

> Now that the black box of vision has been opened it is no longer enough for an "evolutionary explanation" of that power to consider only the anatomical structures of whole eyes, as Darwin did in the nineteenth century, and as popularizers of evolution continue to do today. Each of the anatomical steps and structures that Darwin thought were so simple actually involves staggeringly complicated biochemical processes that cannot be papered over with rhetoric. Darwin's simple steps are now revealed to be huge leaps between carefully tailored machines. Thus biochemistry offers a Lilliputian challenge to Darwin. Now the black box of the cell

[170] W. DEMBSKI, *Intelligent Design* , p. 174.
[171] W. DEMBSKI, *Intelligent Design*, p. 146-149, among others.
[172] M. BEHE, *Evidence for Intelligent Design from Biochemistry*.
[173] M. BEHE, *Evidence for Intelligent Design from Biochemistry*.

> has been opened and a Lilliputian world of staggering complexity stands revealed. It must be explained[174].

Behe's answer is that it can't – at least, not by science, or not by science alone. Models have since then been proposed for the evolution of the bacterial flagellum (and other examples), detailing how such and such protein had functions on their own and came to interact, progressively building up the system, but they have all been found wanting. It appears that they always will: in addition to practical questions that can be answered by experiments (e.g. how interacting proteins evolved simultaneously to form a molecular machine), Behe considers that irreducible complexity includes the *purpose* of a system, i.e. that models breaking down the complex system to unravel its formation in a step-wise manner are not even addressing the issue: 'I emphasize strongly, *the problem of irreducibility remains, even if individual proteins homologous to system components separately and originally had their own functions'*[175]. They are indeed committing 'a transparent fallacy, a brazen equivocation' as they shift 'the focus from the separate function of the intact *system* itself to the question of whether we can find a different use (or 'function') for some of the *parts'*, whereas irreducible complexity characterizes *systems*[176]. Since evolution is, by definition, a gradual process, and since evolutionary models *always* unfold complex structures into its simpler components, they are bound to be mutually exclusive with Behe's irreducible complexity. Behe further comments that 'one has to admire the breathtaking audacity of verbally trying to turn another severe problem of Darwinism into an advantage' – that is, using recent scientific findings against irreducible complexity. Indeed, they showed that the bacterial flagellum was even more complex than previously thought, with the ability to transport external proteins inside the bacterium; to Darwinians arguing that it means the flagellum could arise naturally, by interaction of older complexes, Behe superbly replies that 'taking away the parts of the flagellum certainly destroys the ability of the system to act as a rotary propulsion machine […] thus the flagellum is indeed irreducibly complex'[177].

If we momentarily go back to Dembski's perspective, the bacterial flagellum neatly fits into CSI theory: not only are irreducibly complex systems 'complex in the sense required by the complexity-specification criterion', but 'in virtue of their function, these systems embody

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[174] M. BEHE, *Evidence for Intelligent Design from Biochemistry*.
[175] M. BEHE, *Irreducible Complexity*, p. 359, emphasis in original. Behe's main opponent is biochemist and theist Kenneth MILLER, who first answered in his book *Finding Darwin's God* in 1999; an article from him can be found in the same book, *The Flagellum Unspun; The Collapse of 'Irreducible Complexity'*.
[176] M. BEHE, *Irreducible Complexity*, emphasis in original.
[177] M. BEHE, *Irreducible Complexity*, p. 360.

patterns independent of the actual living systems. Hence, these systems are also specified in the sense required by the complexity-specification criterion'[178]. His definition of complexity leads Dembski, like Behe, to invalidate any reductionist explanatory model, effectively shutting out scientific hypotheses; his definition of specification, on the other hand, is based on his use of human patterns (in the case of the flagellum, human-made rotary motors, which were, obviously, designed before and independently of the understanding of flagella). These, however, are not exactly biologically relevant. In that matter, Dembski does not even consider the most evident pattern – DNA. If there is – of course – a genetic pattern encoding flagella, it is most certainly not independent from it – by definition it cannot. In that sense, flagella are not specified as required by Dembski's criterion, and nowhere does Dembski explain why human-made arrangements would be more valuable to his model than biological patterns[179].

Furthermore, in Behe's opinion, scientific answers to his theory have not only failed to address his hypothesis, but they have even strengthened his position – or rather, IDT's. As Behe rightfully notes, either IDT is scientific or it is not: 'one can't say both that ID is unfalsifiable (or untestable) and that there is evidence against it. Either it is unfalsifiable and floats serenely beyond experimental reproach, or it can be criticized on the basis of our observations and is therefore testable'[180]. Behe accuses Darwinism of being unfalsifiable itself, since its claim is 'some unintelligent process could produce its system', which would need to prove that no other unintelligent process took place, which is basically impossible since unintelligent processes are potentially infinite – contrary to IDT, regarding which showing that at least one unintelligent process happened would be enough[181]. The potential experiments proving irreducible complexity are left untold, which led Michael Ruse to summarize Behe's position with his inimitable humor as follows:

> As it stands, Behe's ideas can be easily protected against any counterevidence. You can explain some phenomenon through evolution? Then either the phenomenon was not irreducible, or it was not complex enough. You cannot explain some phenomenon through evolution? Then either the phenomenon is too complex for an evolutionary explanation, or you will later find such an explanation. Heads I win, tails you lose[182].

[178] W. DEMBSKI, *Intelligent Design*, p. 149.
[179] See H. VAN TILL, *Are Bacterial Flagella Intelligently Designed?* , p. 136-139.
[180] M. BEHE, *The Intelligent Design Hypothesis*, p. 288. See also K. MILLER, *Answering the Biochemical Argument from Design*, p. 292-307.
[181] M. BEHE, *The Intelligent Design Hypothesis*, p. 289. This irresistibly makes us think to the old jest about creationists and fossils – that finding a missing link B between A and C would never satiate creationists since they would immediately start asking why evolution could not explained A' and B'.
[182] M. RUSE, *Can a Darwinian Be a Christian?*, p. 119. See also p. 115-119.

5. Dembski and Behe: a divergent vision of IDT

However, as previously noted, Behe does not reject evolution. Far from it – he accepts common descent with modifications, which Dembski does not, and considers that IDT

> ... can happily coexist with even a large degree of natural selection. Antibiotic and pesticide resistance, antifreeze proteins in fish and plants, and more may indeed be explained by a Darwinian mechanism. The critical claim of ID is not that natural selection doesn't explain *anything*, but that it doesn't explain *everything*[183].

Like Dembski, IDT comes last in his theory-selection process; but unlike him, ID comes also at a last resort, when all others have been abandoned, and certainly not as the favored choice. Regardless, in both cases, IDT struck as utterly similar to the God-of-the-gaps theory, where God as an option must be abandoned once Darwinian mechanisms have been unveiled – although science, by definition, never quite seems up to the task in any of these frameworks[184]. Behe and Dembski also diverge on their understanding of divine action – where Dembski advocated miracles, Behe insists that there is no need for a designer to interfere with natural laws: 'if quantum events such as radioactive decay are not governed by causal laws, then it breaks no law of nature to influence such events' – extending that idea to evolution, as IDT does, would then be no issue[185]. This immensely differs from Dembski's proposal of a Lamarckist evolutionary theory, where CSI would come both from the parents and from the environment[186].

Furthermore, Behe plainly states that IDT assumes nothing about the designer, which means that it doesn't have to answer to the argument from evil; the issue of his omnipotence, his competency, or his interest into details, is not even raised, which means that design needs not be optimal. Even if it has theological and metaphysical implications, IDT is a purely scientific theory, i.e. 'critically depending on physical evidence found in nature' rather than on first principles[187]. As we have seen, Dembski's premises are clearly different; consequently, his answer to suboptimal design – dysteleology – is as antithetic: it is not so much suboptimal as perverted due to evil and to the Fall, a fact that must be recognized, otherwise 'it avoids both the scientific challenge posed by specified complexity, and it avoids the hard work of faith,

[183] M. BEHE, *Irreducible Complexity* , p. 356, emphasis in original.
[184] See e.g. M. RUSE, *Can a Darwinian Be a Christian?*, p. 122; H. VAN TILL, *Are Bacterial Flagella Intelligently Designed?*, p. 127; Robert T. PENNOCK, *DNA by Design ?*, p. 142. K. Miller says nothing else in *Answering the Biochemical Argument from Design*, p. 293.
[185] M. BEHE, *Irreducible Complexity*, p. 358.
[186] W. DEMBSKI, *Intelligent Design*, p. 174-179.
[187] M. BEHE, *The Intelligent Design Hypothesis*, p. 277-278.

whose job is to discern God's hand in creation despite the occlusions of evil'[188]. On the other hand, this does not prevent Dembski from explaining that IDT has 'no prior commitment to supernaturalism': instead of opposing natural and supernatural causes, 'the proper contrast is between *undirected natural causes* on the one hand and *intelligent causes* on the other. Intelligent causes can do things than undirected natural causes cannot. […] Whether an intelligent cause is located within or outside nature (i.e., is respectively natural or supernatural) is a separate question from whether an intelligent cause has acted within nature'[189].

Dembski's reasoning leads us back to where we began – IDT's claim to be a purely scientific theory. Notwithstanding all the elements pointing toward IDT as only the first step in a political and cultural movement aiming towards a re-Christianization of American society, countless debates have already been conducted about that allegation and about what science requires to be what it is[190]. Regardless of one's definition of science, Dembski's answer to suboptimal design is clearly not scientific – it is nothing short of a full theological perspective on nature. While he is perfectly entitled to do that at a personal level, giving a metaphysical reply is scientifically irrelevant, even by the criteria used by ID theorists as presented in this section. What would prove far more interesting would be to apply Dembski's criterion to other structures than Behe's self-proclaimed irreducibly complex systems: if we can indeed detect design, then it is a whole new branch of science that opens. Where is it found? In specific lineages? Do they have common properties? Further than detection – is design quantifiable? If yes, which species would show more design than others? What are the mechanisms behind design?

These questions were asked twelve years ago by philosopher Gregory Peterson; ten years ago, Dembski himself was privately acknowledging the insufficiency of IDT scientific research[191]. Peterson kindly stated that 'at best, [IDT was] a science waiting in the wings'[192].

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[188] W. DEMBSKI, *Intelligent Design*, p. 264.

[189] W. DEMBSKI, *Intelligent Design*, p. 259, emphasis in original. A similar balance is found regarding political implications of IDT: Dembski seems to be able to both assert that 'it is a problem that intelligent design is politicized from all sides' and that 'the scientific research and cultural renewal aspects of ID need to work together, protecting and reinforcing each other' within two months of each other. That said, Dembski insists on both papers that the scientific research of IDT is lagging behind and must be reinforced. These quotes come respectively from R. FLIESTRA, *William Dembski and John Haught Spar on Intelligent Design* and W. DEMBSKI, *Becoming A Disciplined Science. Prospects, Pitfalls and Reality Checks for ID*.

[190] Regarding IDT specifically, see e.g. Gregory PETERSON, *The Intelligent –Design Movement: Science or Ideology?*. As the same criteria tend to be used for IDT and creationism, see also Michael RUSE (ed.), *But is it Science?* and W. DEMBSKI, *Intelligent Design*, p. 252-260.

[191] G. PETERSON, *The Intelligent –Design Movement*, p. 19-21; W. DEMBSKI, *Becoming A Disciplined Science*.

These questions have never been answered. Better yet, they have never been openly asked by ID theorists. Like creationists, they seem content with negatively rejecting evolution without ever proposing an alternative mechanism beside 'an intelligent agent willed it that way, now be a dear and stop asking questions'. Such an answer would not even be scientific were it not for IDT's extra-large understanding of science, its refusal of methodological naturalism and its self-serving definitions of chance and design. This vision is restricted to ID proponents (or rather, some of them); to the rest of the world, if only for its refusal to discriminate between methodological and ontological naturalisms and its rejection of the former along with the latter, IDT is not science. Like creationists and materialists, ID theorists confuse science with metaphysics.

[192] G. PETERSON, *The Intelligent –Design Movement*, p. 21.

IV. John Haught: a theology of evolution

Evolutionary theory has not been met only with defiance or disdain by theologians of all confessions; it has also been welcome with curiosity and interest, and has even sometimes been integrated into new theological frameworks, which are usually grouped under the name of 'theistic evolution' or 'evolutionary theology'. The exact articulation of evolution and theology varies from one scholar to another, but common features can be established: they include a complete acceptance of scientific results including Neo-Darwinism, which is carefully distinguished from scientific materialism; a conception of God as creator both at the beginning of the world (*creatio ex nihilo*) and throughout history (*creatio continua*); the belief in the visibility of divine action through natural laws (the issue of miracles as potentially contravening these laws is left unanswered) and a vision of life as an ongoing process[193]. Theistic evolution is not promoted only by theologians; scholars with a primary education in science (and a later formation in theology), like physicists Ian Barbour and John Polkinghorne or biochemist Arthur Peacocke propose their own version of evolutionary theology. As representative of this movement, we have chosen Catholic theologian John F. Haught, who was been working on the articulation of evolution and theology for the past three decades. This section will therefore present on his vision of theistic evolution – which he refers to as a theology of evolution – with a focus on his understanding of contingency, purpose and providence.

A. Setting the scene: religion, theology, materialism and naturalism

In order to properly comprehend his systematic developments, situating his position on the science/religion debate is necessary. Haught addresses the various metaphysical positions in the science/religion debate by classifying them into neatly delimited categories. Religion is, quite typically, differentiated from theology, and his interest clearly lies with the latter – the aforementioned debate actually occurring between science and theology rather than religion: religion is usually taken in a broad sense as the 'conscious appreciation of and response to the mystery that grounds, embraces and transcends both nature and ourselves'[194], i.e. as the acceptance that the material world is not all there is, while theology, restrictedly applied to

[193] T. PETERS, *Constructing a Theology of Evolution: Building on John Haught*, p. 924-925.
[194] J. HAUGHT, *Is Nature Enough?*, p. 22. Unless stated otherwise, all future references in this section have J. Haught for author.

Catholicism or at most Christianity, is a critical reflection discussing what 'is *really going on*'[195] in the universe, whose 'business is that of addressing the larger questions that arise when enlightened inquirers find themselves wondering about the meaning of what science has observed'[196] in order to explain ' in the *ultimate* way why the universe has these generic features'[197] discovered by science. More precisely, 'a theology of evolution is a systematic set of reflections that tries to show how evolution, including those features that skeptic scientists consider to be incompatible with religious faith, illuminate the revolutionary image of God given to Christian faith'[198].

As we shall later expand on, neither religion nor theology are hence in conflict with science itself. They are, however, with any kind of scientific materialism or naturalism. Haught defines the former as 'the belief that reality consists ultimately of mindless and lifeless bits of matter', equaling it with physicalism[199]. Materialism entails cosmic (or tragic) pessimism – 'the sober conviction that the universe as a whole lacks any purpose whatsoever'[200], or in other words, the belief that 'absolute nothingness [is] the ultimate destiny of the universe', including us[201]. Materialism is included within naturalism, or 'the belief that nature is all there is, and that no overall purpose exists in the universe'[202], which is much broader and encompasses several opinions which are not mutually exclusive: scientific naturalism adds scientism, i.e. science as the only reliable way to understand the world; soft (or religious) naturalism commonly applies religious vocabulary about mystery or sacredness to nature, whereas hard naturalism is quasi-synonym of materialism and cosmic pessimism; sunny naturalism believes nature is enough to fulfill all our spiritual needs, while shady (or sober) naturalism concludes that it is not, leading to a more pessimistic, or even nihilistic, perspective. Finally, Haught recently created a special subclass within materialism for the 'new atheism', represented by Richard Dawkins, Daniel Dennett, Sam Harris and Christopher Hitchens, all authors of anti-religion books; in his mind, their creed is only new because of

[195] *Deeper than Darwin*, p. 64, emphasis in original.
[196] *Christianity and Science*, p. 47.
[197] *God After Darwin*, p. 99, emphasis in original.
[198] *Responses to 101 Questions on God and Evolution*, p. 49.
[199] *Christianity and Science*, p. 9.
[200] *Science and Religion*, p. 168.
[201] *God After Darwin*, p. 123. See also p. 107-108 and *Christianity and Science*, p. 53-57.
[202] *Is Nature Enough?*, p. 2. See also p. 4-13 and *Christianity and Science*, p. 10-12.

'their astounding intolerance of faith in any form'[203] and their will to eradicate it, since it is the cause of so many evils on Earth.

However, although Haught sometimes gives examples of scientists falling into one or the other category when he defines them, he never specifies exactly who or what opinion he is dealing with in other sections of his writings, preferring to refer to these schools of thought by wide, broad considerations. When not laying out his careful classification system, he doesn't seem to distinguish between materialists and naturalists; his only precision consists in noting at the beginning of each book that 'naturalism' is used as a synonym for 'scientific naturalism' unless otherwise stated, which unfortunately doesn't help keeping the confusion at bay[204]. Similarly, at the opposite end of the spectrum, theologians – with the striking exception of supporters of process theology – are rarely, if ever, quoted in Haught's works, neither as support nor as opposition. Patristic and scriptural references are equally sparse, which may be quite surprising for a Roman Catholic theologian writing in the globally Protestant American society[205].

B. Building a theology of evolution: two key concepts of Haught's theology

Regardless, Haught refutes tenants of both materialism and naturalism with a similar reasoning based on a double argument, the hierarchy of explanatory levels and the limits inherent to the scientific method; the first element is also central to his opposition to creationism and IDT. Already proposed in Haught's earliest works thirty years ago, both are crucial to his articulation of science and theology and deserve to be treated at length.

1. Layered explanation

> The cosmologies implied in mythic, religious and most philosophical systems of the past have been hierarchical in nature. They have usually delineated four realms of cosmic being: mineral, plant, animal, man. And above or encompassing these they have intuited another level, that of 'ultimate reality', variously named and imaged in different traditions. Our ordinary language and thought are still conditioned by hierarchical thinking. And even evolutionary theory continues to rely upon the

[203] *True Believers*, p. 17. This article is a summary of Haught's book *God and The New Atheism* (2008). The incriminated authors respectively published *The God Delusion* (2006); *Breaking the Spell* (2007); *The End of Faith: Religion, Terror and the Future of Reason* (2004) and *Letter to A Christian Nation* (2006); *God Is Not Great: How Religion Poison Everything* (2007).

[204] See e.g. *Is Nature Enough?*, p. 9. See also A. MICHAUD, *John Haught – Finding Consonance Between Religion and Science*, p. 918-919.

[205] L. CHAPP, *Review of* Is Nature Enough?, p. 645. Chapp's astounded observation – himself a theology professor at Roman Catholic DeSales University in California – arises from his reading of *Is Nature Enough ?*, but we have found that it could be extended to all the works we read, which are referenced in this section.

> hierarchical distinctions of levels, though it envisages them as stages in a horizontally linear movement with the lines of demarcation somewhat blurred[206].

Though readily admitting 'not [being] entirely happy with the expression 'hierarchy of levels' since it fails to accentuate sufficiently the processive nature of reality', Haught emphasizes that 'hierarchical thinking of some sort is necessary if our evolutionary universe is more than one-dimensional'[207]. This hierarchy of levels is indeed coupled with a hierarchy of explanations, i.e. the fact that 'each event in the universe is indeed open to a plurality of levels of explanations'[208]. This observation can readily be made even within science, where a phenomenon can (at least theoretically) be explained at the physical, chemical or (when applicable) biological levels. As a matter of fact, 'explanatory pluralism' or 'layered explanation', as Haught calls it, is part of the scientific methodology: 'each scientific discipline […] inevitably leaves out a great deal – precisely in order to give the distinct kind of explanation characteristic of its approach. Each scientific explanation is an abstraction. It leaves something out that other sciences may be able to compensate'[209]. Haught postulates that this can be applied to science as a whole – that it 'still leaves out a great deal of the world's inherent substance, intelligibility and depth'[210], meaning that there is room in the explanatory space for philosophy and theology at the ultimate, fundamental level[211]. Pretending otherwise – claiming it is well within science's capabilities to explain every single phenomenon of the universe – would be showing 'explanatory monism', a crime of which scientific creationists, ID theorists and scientific materialists are all found guilty.

2. Interlude: Haught's criticism of creationism and IDT

In Haught's opinion, all three indeed consider that the world can be explained at only one level, which – rather paradoxically – attempts to be more scientific than theological, since even scientific creationists 'tacitly accept modern science as the authoritative road to knowledge'[212] by deeming the Bible to be scientifically relevant. Explanatory monism is the primary fault of these three metaphysics – their inability to distinguish between scientific and theological levels leads to their conception of the cognate explanations as competitive instead

[206] *The Cosmic Adventure*, p. 89.
[207] *The Cosmic Adventure*, p. 89.
[208] *Is Nature Enough*, p. 16.
[209] *Deeper than Darwin*, p. 42.
[210] *Deeper than Darwin*, p. 43.
[211] In an avowedly Aristotelian perspective, Haught considers that this fundamental level is essentially the purpose of the world – the final cause - whereas material causes can be dealt with by science. See e.g. *Is Nature Enough?*, p. 74-76. We shall come back to this when discussing purpose.
[212] *Responses to 101 Questions on God and Evolution*, p. 74. See also *Deeper than Darwin*, p. 18-19.

of complementary[213]. Their vision of science and theology as in opposition or in conflict is a direct consequence of this conflation.

Haught is not highly interested in scientific creationism; it is certainly not science and it is poor theology, insisting on trivializing biblical texts by putting them down at the same level as modern scientific discourses, and hence barely deserves attention[214]. He is keener on discussing IDT, noting that nearly all its proponents are from a theist background and that the idea of intelligent design cannot but refer to a designer and therefore some kind of deity, making it 'hard to suppress the suspicion that they are appealing to ultimate theological explanations'[215]. Haught goes as far as saying that he 'suspect[s] that much of the energy underlying so-called ID theory, in spite of explicit denials by some of its advocates, is an achingly religious need to protect the classical theistic belief in divine Providence'[216]. While we won't discuss Haught's own idea of providence now, his premise is quite clear: IDT rose as a misguided attempt to oppose the materialistic metaphysics often associated with evolutionary theory and which ended up rejecting evolution due to its failure to properly distinguish science and scientism. Another argument Haught yields against IDT is that neither intelligence nor design are enough to describe nature or divine action; we will also delve on these notions later on.

3. Hierarchical cosmology and information

As already mentioned, Haught considers that hierarchical thinking is still present in our evolutionary worldview; however, it cannot be thought in the same mode as before, since evolution 'looks at things chronologically or historically rather than historically. From this horizontal perspective, lifeless and mindless matter seems to be the author of all'[217]. This change of perspective is responsible, among others, for the apparent revocation of the special place usually awarded to mankind in hierarchical structure. Nonetheless, common descent – which Haught firmly accepts [218] – is only part of the issue with the evolutionary story, as it is

[213] *Darwin, Design and Divine Providence*, p. 231-232; *Christianity and Science*, p. 116-117.
[214] *Responses to 101 Questions on God and Evolution*, p. 71-80. Interestingly, Haught warns his reader against the rhetoric skills of creationist regarding the interpretation of Scripture (or rather lack thereof) and their tendency to quote only 'snippets of dubious information' (p. 78), along our own caution in section II.
[215] *Deeper than Darwin*, p. 89. See also Haught's testimony in the 2005 trial against IDT published in Judge E. Jones III's judgment, especially p. 24-26.
[216] *Darwin, Design and Divine Providence*, p. 229.
[217] *Responses to 101 Questions on God and Evolution*, p. 25.
[218] *Responses to 101 Questions on God and Evolution*, p. 19-20.

our whole mindset which is challenged by the atomization (or reductionist approach) and historicization (or horizontal transformation) of the ancient hierarchy:

> If there are no sharp breaks in this evolutionary story, the hierarchical sense of discontinuity that formerly separated matter from life, and life from mind, seems to get blurred out in the seamless flow of the evolutionary river. The question then arises whether any basis exists for the timeless assumption by religions and cultures that life is 'higher' than matter, or that mind, spirit or soul even exist at all[219].

Haught's embedding of hierarchical thinking in evolution goes through the dichotomy between emergence and resultance:

> An emergent universe is an evolutionary one in which each successive phase adds something qualitatively new. The emergent phase is more than the sum of its antecedents'. […] A resultant universe would be one in which each successive evolutionary development is nothing more that the additive 'result' of antecedent component physical parts and movements. Such is the universe of materialism[220].

New phases – new levels – are more than their antecedents because they contain more information. 'Information' is absolutely central to Haught's conception of layered explanation and of divine action. Its definition is somewhat similar to Dembski's: 'by 'information' I mean, in a broad and general sense, the overall ordering of entities – atoms, molecules, cells, genes, etc. – into intelligible forms or arrangements'[221]. What the theologian depicts based on this notion, though, is entirely different. Information is pattern or order; it is what Aristotle named shape or form, without which matter would not exist[222]. The use of this word by scientists seems to him a proof that they have now acknowledged that there is more to nature than visible at first sight. Moreover, information itself is not readily detectable by scientific experiments, even when its carriers – DNA springs to mind – are well-known. Last but not least, information introduces a discontinuity of levels into what otherwise appears as a complete continuum without violating any kind of laws at the lower levels: the information contained in DNA is able to order cellular components without being visible at an atomic level. Haught borrows Polanyi's example of a note jolted down on paper to clarify his meaning: there is a physical continuity between the molecular level (e.g. the bonds between the ink's and the paper's molecules) and the reading level, but the fact that this note has some

[219] *Responses to 101 Questions on God and Evolution*, p. 25. See also *God After Darwin*, p. 59-61.
[220] *The Cosmic Adventure*, p. 89.
[221] *God After Darwin*, p. 70. See also *Responses to 101 Questions on God and Evolution*, p. 25.
[222] *The Cosmic Adventure*, p. 84; *Science and Religion*, p. 164-166.

meaning to us has no impact on its physical properties, nor is it even discernible at that level – hence the discontinuity created by information at the higher level of reading[223].

This also means that higher levels cannot be reduced to lower levels, since information at the former cannot be grasped from the latter: 'there is something distinctive about each level, an ontological discontinuity that renders the higher levels more valuable and more real, though also more elusive, than the lower. Consequently, life cannot be explained solely in terms of the hard sciences'[224]. Haught leads us back to his departing point: science alone cannot occupy the whole explanatory space – theology has its own role. Another aspect of his 'hierarchy principle' is the unobtrusiveness of the higher levels – they do not interfere, which is why they are unobservable in the first place. From Haught's admission, the functioning of information is still unclear; the more we can say is that it works 'only by *comprehensively* integrating particulars (atoms, molecules, cells, bits, and bytes) into coherent wholes'[225]. Surprisingly, this leads the theologian to reason in a very similar fashion to Behe's defense of irreducible complexity:

> Any attempt to specify the comprehensive function of informational patterns in terms appropriate only to the comprehended particulars themselves is logically self-contradictory. Vague suggestions that the increasingly complex and comprehensive levels in evolution simply 'emerge' or 'bubble up from below' do not explain anything. […] Such bootstrapping, I would submit, is logical nonsense[226].

Such incisive dismissal of classical scientific models hits quite close to IDT; it is no surprise that Behe himself, on his review of that book, positively commented on Haught's major ideas[227]. This argument sounds even more similar as Haught eventually defines this source of information: God. Of course, God is not limited to be 'the ultimate source of the novel

[223] *God After Darwin*, p. 71-72. Another of Haught's analogies is quite similar: scientific laws are like grammatical rules – they constrain how to write, but they cannot account fully for the meaning of the note. Correct grammar does indeed not mean that the text itself will make any sense. Similarly, theology can interpret scientific findings without creating any interference, while the most fundamental level is not within the reach of science. See *Deeper than Darwin*, p. 67-68 and *Christianity and Science*, p. 58.
[224] *Christianity and Science*, p. 134. See also *The Cosmic Adventure*, p. 90-93.
[225] *God After Darwin*, p. 75.
[226] *God After Darwin*, p. 75.
[227] For information, Michael Behe was asked to review Haught's *God After Darwin* in 1999. His comments were utterly approbatory – he noted several times on how both Haught and himself had been misinformed about the respective position, but that they were actually agreeing on the major points, concluding that 'John Haught believes in intelligent design as much as does William Dembski'. Haught's disapproval of IDT was at the time much smoother than it is now (see e.g. p. 3-4, 25 or 36).

informational patters available to evolution'[228]; however, it is rather understandable that Behe identifies Haught's information-giving God with his design-infusing deity.

4. Nature's depth and the danger of literalism

'Depth' is a key word to understanding another analogy Haught uses to help us grasp layered explanation – reading levels. Refreshing the ancient conception of the universe as a book which could only be read at the deepest levels by the appropriately trained minds, the theologian proposes that it might still be useful today:

> Perhaps the universe is at least in some sense comparable to such a book [calling for deeper readings]. If so, the natural sciences, while able to read it at a certain level, are still leaving something out. For that matter, religions likewise leave out a great deal in their own readings of the universe, while perhaps also being able to retrieve levels of depth that science cannot. If so, it would follow that learning to read the universe in multiple ways would enrich all of us. […] Academic science is skilled at decoding nature. But it is not equipped – and rightly so – to probe for deeper meanings beneath the deconstructed surface of nature. […] Our enchantments with the close-up, fine-grained view of life that science provides may divert us from reading the depths below. Having reached a high level of scientific literacy, we now have the problem of how to avoid getting stuck at the level of a 'cosmic literalism' made possible, ironically, by our new literacy. Fixation on the scientific understandings of nature, including the Darwinian, threatens to make cosmic literalists of all of us[229].

Literalism is 'equivalent to a shallow perusal, one that skims along the surface, whether of religious texts or of nature. […] Literalism, in fact, is the outcome of a refusal to look into the depth, whether of religious texts or of the universe'[230]. If creationists are literalists of the Book of Scripture, then materialists are literalists of the Book of Nature. Literacy at one level, Haught argues, should not lead to literalism at another – i.e. a better scientific understanding of nature should not entail a rejection of all other possible ways of making sense of it. Science and theology are not concerned with the same reading (or explanatory) levels, since theology, as already mentioned, deals with the *ultimate* level – the deepest one, unreachable by science[231]. Science does not seek depth but clarity, two distinct notions in Haught's mind. Clarity is of course necessary if we wish to be understood, but 'is almost inevitably going to be purchased at the price of depth. So the closer we come to the universe's true depth, to *what*

[228] *God After Darwin*, p. 73. See also p. 78 and 136, *Responses to 101 Questions on God and Evolution*, p. 93 and G. SCHAAB, *An Evolving Vision of God: The Theology of John F. Haught*, p. 898-899.
[229] *Deeper than Darwin*, p. 14-15. The notion of 'depth' is developed throughout that book and has given it its title.
[230] *Deeper than Darwin*, p. 31.
[231] Rather paradoxically, theology therefore appears to occupy both the higher and deeper levels.

is, the more our clear and distinct ideas will have to give way to symbol and metaphor'[232]. Scientific discourse is an abstraction – it leaves too much out to go in deep enough in the universe:

> We must learn to mistrust our abstractions, not because they are wrong but because they fail to take us very far beneath the surface. On the other hand, as religions would insist, myth, metaphor and symbol have the power to lead us straight toward the depths. Readings that are clear and distinct may be intellectually satisfying, but they are existentially trivial. Complete conceptual clarity, therefore, is certainly out of place in religious awareness. This is necessarily so because the depth into which religions initiate comprehends us much more that we can comprehend it. We cannot intellectually encompass that which already enfolds our own being. We can have an awareness of being grasped by depth, an awareness that we may call 'faith'. But if we attempt to subject the depth of the universe to our scientific control, this depth will slip even further beneath the surface. And in response to its elusiveness, we may be inclined to deny that it has any reality at all[233].

Having thus simultaneously defended theology's right to be vague and condemned science for being too clear and precise to tell us anything really relevant, Haught adds a further element to define depth, in agreement with apophatic theology – depth sometimes requires silence, waiting, reverence[234]. Such quality is sorely lacked by both scientific materialism and IDT, which are here at fault for trying to provide an ultimate explanation too soon. At least 'one of the lessons that a more seasoned theology has learned from modern science is that we must all postpone metaphysical gratification'[235] until science has exhausted all its possible experiments to yield a better understanding of the world – more specifically here of design. The fundamental level will be reached by theology only in due time.

Fortunately for the scientific party in the science/theology debate, this rather mystical view does not belittle science too much – only scientism or scientific materialism; science is indeed as necessary to build a proper understanding of the world as theology is[236]. Moreover, it is in the very interest of theology: 'it is imperative that the understanding of revelation presented to them [scientists and other intellectuals] is in no way contradictory to the most up-to-date versions of contemporary science'[237]. Haught regularly insists on his respect for science and

[232] *Deeper than Darwin*, p. 46, emphasis in original. See also *Responses to 101 Questions on God and Evolution*, p. 94-96.
[233] *Deeper than Darwin*, p. 47. See also *The Cosmic adventure*, p. 93-97, where Haught already develops the epistemology of control (or the refusal to accept that our knowledge is limited) and faith as self-openness to higher levels.
[234] *Deeper than Darwin*, p. 18. See also *Christianity and Science*, p. 19-33.
[235] *Darwin, Design and Divine Providence*, p. 236-237.
[236] *Responses to 101 Questions on God and Evolution*, p. 37.
[237] *Christianity and Science*, p. 49.

his belief in its importance for theology: 'I want to emphasize once again that theology does not have any business in ever functioning as an *alternative* to scientific explanation. It is never good form for theology to object to any attempts to carry naturalistic explanations as far as they can conceivably be taken. […] Science must be given free rein to explore all explanatory possibilities'[238]. The theologian names this position on the science/theology debate 'contact' or 'engagement': recognizing that theology cannot be entirely separated from science, which plays too important a role in today's society, it aims at distinguishing them 'only in order to relate them more meaningfully to each other'[239]. The contact approach is aware of the temptation of conflation and the appeal of contrast or separatism – science and theology sharing no common goal or methodology, they should be kept in different categories – and tries to negotiate in-between in a never-ending process.

5. Scientific limitations

In Haught's mind, the sheer inability of science to go deep enough to give us the ultimate explanation is unavoidable since it arises from its very methodology. Science is indeed restricted to what it can objectively reach; subjectivity is by definition excluded. The issue, then, is that the theoretic field science is concerned with is not the only road to a better understanding of what is *really* going on; Haught adds four others, which he calls the primal modes of knowing: affectivity, intersubjectivity, narrativity and beauty. They are as necessary as theory in order to properly envision the world, but are not taken into account by science – worse, they are rejected by scientism. Notwithstanding scientific materialism, this deprives science of any access to the *real*: 'it there is a 'more-than-nature', it could never be grasped cognitionally in the same way that things in nature are mastered by science. Transcendent reality would first come to our awareness in the primal regions of knowing […] rather than in the theoretic or objectifying field. This is because religion is less a matter of grasping than of *being grasped*'[240]. By defining a perspective where all existential knowledge can come only from 'a richer empiricism' including the realm of subjectivity, Haught renders science definitely ill-equipped to look at the fundamental level: science is just 'not empirical

[238] *Is Nature Enough?*, p. 72-73, emphasis in original.
[239] *Christianity and Science*, p. 120. The whole system is explained in p. 116-120. Haught already develops a similar classification in 1995 in *Science and Religion*, which he used throughout all his book. See also the conflict-separation-engagement partition in *Responses to 101 Questions on God and Evolution*, p. 38 and in *Deeper than Darwin*, p. 69-83.
[240] *Is Nature Enough?*, p. 54. See p. 32-54 for a discussion about the three-fold cognition pattern, which Haught draws from B. Lonergan, and about critical intelligence and the five fields of knowing. See also *Christianity and Science*, p. 55-57 and *Theology, Evolution and the Human Mind*, especially p. 924-926.

enough'[241]. One could wonder, though, why Haught never mentions any social sciences – what do psychologists if not attempting to understand our own subjectivity?[242]

Finally, Haught adds a third criticism, not to science itself, but to scientific materialism: on which ground do materialists justify their confidence in their own critical intelligence?[243] Haught asserts that an intelligence arising from purposeless and mindless processes cannot be trusted – that evolutionary theory is simply not enough to account for the appearance of mind. We would have been quite interested into understanding exactly *why* this is the case, but unfortunately, Haught only repeats his creed in all possible ways, wondering louder and louder how naturalists do not realize that evolution 'of course, is a good and interesting story as far as it goes, and it may be illuminating and interesting'[244] but cannot explain our intelligence, and that the 'faith' they place in their own mind cannot be adequately warranted by their metaphysical premises – by utter mindlessness. Haught accepts that evolution has played a role into the emergence of intelligence; but it is not sufficient: the sole way to justify human intelligence would be if its ultimate environment is God. This reasoning seems to us to neatly fall into Dawkins's category of 'Argument of Personal Incredulity'. Haught, indeed, never acknowledges any field research by evolutionary psychology, although it has produced quite impressive models for the emergence of mind – a statement which, as we see, can be applied to his whole systematics. Moreover, he never realizes either than the mind, albeit more complex, is no different than the hand in an evolutionary perspective – it has been selected over time for its better performance. If materialists can trust their hands to grip objects because their opposable thumbs are quite good at that, why shouldn't they trust their mind to achieve its own task of understanding the world?

C. Building a theology of evolution: six accommodation *loci*

In spite of its obvious limitations, science has placed theology in an unexpected predicament – a complete change of worldview, from a static to an evolutionary mindset. Haught urges theologians to seize this unprecedented opportunity in order to enlarge their own vision of God and of His action in nature. More specifically, he notes six key issues on which evolution

[241] *Is Nature Enough?*, p. 120. See p. 119-125 for a development about richer empiricism.
[242] L. CHAPP adds another interesting argument, though it is tangential to our topic: transcendent arguments are hardly persuasive precisely due to their inner subjectivity. How are we to ascertain that the transcendent reality we perceive is real and not illusory ? (*Review of* Is Nature Enough?, p. 643).
[243] For a discussion of additional materialistic beliefs that Haught deems self-contradictory, see *The New Atheists* and its summary in *True Believers*, p. 18.
[244] *Theology, Evolution and the Human Mind*, p. 928. See p. 926-929; *Deeper than Darwin*, p. 97-100; *Is Nature Enough?*, p. 98-117.

has a rather direct impact: creation, eschatology, revelation, divine love (or grace), divine power and redemption[245].

Evolution has indeed emphasized creation as an ongoing process, while it has been previously more thought of as *creatio ex nihilo* rather than *creatio continua* and *creatio nova*. However, 'the notion of an originally and instantaneously completed creation is theologically unthinkable': such a world would only be an 'appendage' to God, without any independence or autonomy[246]. Life is a movement; if fixed, it decays. Moreover, only an unfinished world could truly receive God by continuously adapting and growing to accommodate his progressive self-disclosure: 'the fullness of divine infinity cannot be received instantaneously by a finite cosmos. Such a reception could take place only incrementally or gradually'[247]. Evolution not only enlarges creation, but revelation as well.

Such is also the case of redemption and eschatology – hope. Indeed, an unfinished world cannot be perfect – it is constantly getting closer and closer, but it is certainly not there yet. In Haught's eyes, not only does this explain what we called dysteleology, but also the appearance of evil – the struggling and suffering inherent to natural selection. The theologian is quite concerned with the issue of evil, which is of primary theological importance and often brought up by adversaries to religion. He is of the opinion that Christian theodicy should not account only for the suffering of mankind, but of every sentient being – after all, 'we owe our existence and our organic complexity to the sacrifice of innumerable generations of organisms and now defunct species'[248]. Our kinship to other species does not allow us to arbitrarily forget them in our quest for redemption. Consequently, our interpretation of suffering as an expiation for the Fall is no longer accurate – it is much too anthropocentric, for most of suffering is actually innocent from any act of human rebellion. Therefore, Haught considers that Christ's suffering on the cross assumed 'eons of evolutionary suffering in the universe', and that suffering is actually creation's call for redemption, for its completion[249]. Through

[245] *God After Darwin*, p. 36-43. See *Responses to 101 Questions on God and Evolution*, p. 47-56.
[246] *God After Darwin*, p. 36.
[247] *God After Darwin*, p. 39.
[248] *Christianity and Science*, p. 98. See p. 96-107 for a complete development on Haught's theodicy. Haught also notes that the doctrine of original sin cannot be understood as before either – if the world was created in an imperfect state, there could have been no Fall from perfection. Original sin means that we are 'stained' by living in a world where so many human beings refused to answer God's call. This is also treated in *Responses to 101 Questions on God and Evolution*, p. 80-81, where it is assimilated to our estrangement from God.
[249] *Christianity and Science*, p. 93. See also *Responses to 101 Questions on God and Evolution*, p. 123-129.

Haught's kenotic theology of creation, the Christian hope for redemption is hence extended to the whole cosmos[250].

If not enlarged, the classical understanding of divine love and power is certainly transformed in order to both integrate and transcend evolutionary data. Love, Haught argues, means freedom, and not coercion, of the other. Without independence of one's partner, no intimacy, no dialogue, no actual relationship is conceivable. 'Consequently, if there is any truth to the central religious intuition that God loves the world with an unbounded love, then God's 'grace' must also mean 'letting the world be itself''[251]. God's infinite love for His creation guarantees its autonomy as a world:

> This love might even take the form of a self-withdrawal, precisely as the condition for allowing the world to emerge on its own so as to attain the possible status of being capable of a deep relationship with God. Only a relatively independent universe, a universe allowed to 'be itself', could be intimate with God. Theologically interpreted, therefore, the epic of evolution is the story of the world's struggle – not always successful or linearly progressive – toward an expansive freedom in the presence of self-giving grace[252].

In this perspective, God's power is markedly visible in His infinite love for His creation – it is persuasive, not coercive. Furthermore, this power is 'most mightily expressed in humility'[253] as conveyed by His defenselessness on the Cross – the supreme exercise of divine power is the humble self-renunciation to His creation and the acceptance to let something other emerge. Building on process theology, and Alfred North Whitehead in particular, Haught holds that 'if power means 'the capacity to influence', then a persuasive God is much more powerful than a hypothetical deity who magically forces things to correspond immediately to the divine intentions'[254]. Coercion would indeed be incompatible not only with human freedom – an old theological debate – but also with the 'prehuman spontaneity that allows the world to evolve into something other than its creator over the course of billion of years'[255]. No independent world could arise from an instantaneous and perfect creation by a coercive will. This is not exactly a recent view, Haught immediately notes – God as infinite

[250] Haught relates this expansion to his ecological concern – not only because of our potential stewardship but out of our very relatedness should we care for nature. The biblical promise of salvation now encompasses the evolving world, which is in itself a promise of God – what Haught calls 'the promise of nature'. See *God After Darwin*, p. 145-164.
[251] *God After Darwin*, p. 40.
[252] *God After Darwin*, p. 40.
[253] *Responses to 101 Questions on God and Evolution*, p. 117. See p. 114-117. Haught applies directly the word 'defenselessness' to God on p. 114.
[254] *God After Darwin*, p. 41. See also *Responses to 101 Questions on God and Evolution*, p. 135-136.
[255] *God After Darwin*, p. 41.

love is at the heart of Christian faith. Emphasizing the freedom entailed by this love, however, allows for a renewal of this millenary-old conception. Evolution, is this perspective, is only the manner through which the world 'wanders about' or 'experiments' toward its end[256].

Let us briefly observe that at first glance, Haught's conception of God allowing the world to go its merry way by self-withdrawal would not seem much different from the otiose god of deism, were it not for the immediate addition of kenosis – leading to the paradoxical conclusion of a God sufficiently absent for His creation to self-actualize and sufficiently present to share its suffering. Aware of this apparent self-contradiction, Haught denies having a deistic vision of God – God is not uninterested in the universe. Even the vision of God as primary cause is not sufficient because it would be akin to remove God from His creation in a similarly deistic fashion[257]. On the contrary, 'it is out of a longing to relate deeply to the world that God foregoes any annihilating 'presence' to the world. […] But this 'absent' God is 'present' to and deeply united with the evolving world precisely by virtue of selflessly allowing it to achieve ever deeper autonomy'[258]. How He could be both is probably anyway unfathomable, as His ways usually are; or it is a fine example of theology's prerogative to vagueness. Nonetheless, not all theologians are convinced by Haught's theory, as his theodicy appears at risk to become a divine license to suffering. Kenosis might be better thought of as God joining His creatures at their very weaknesses, with maybe an insistence on suffering with the unfit rather than 'bless[ing] through withdrawal 'survival of the fittest''[259]. His explicit rejection of the expiatory vision of sin and evil to account for suffering is also pointed to for being at odds with the Church's Tradition – some deeper argumentation is clearly required there[260].

D. Building a theology of evolution: incorporating the 'Darwinian recipe'

If evolution is the world's road of receiving God, then randomness, law and deep time – the three elements Haught identifies as key to evolutionary theory – must somehow fit in the picture. As a matter of fact, they can be integrated so well in his theology of evolution that they appear as if they were required for it to make sense, as if they could be deduced from logical thinking: 'perhaps, then, it is ultimately because of God's self-abandoning humility

[256] *Responses to 101 Questions on God and Evolution*, p. 50.
[257] *Deeper than Darwin*, p. 57-58.
[258] *God After Darwin*, p. 114. See also *Responses to 101 Questions on God and Evolution*, p. 119-120 and 139-140.
[259] T. PETERS, *Constructing a Theology of Evolution: Building on John Haught*, p. 932-933.
[260] L. CHAPP, *Review of* Is Nature Enough ?, p. 644-645.

that the Darwinian recipe consists of its three ingredient: contingency, lawful constraint, and abundant time'[261].

Nature's contingency is defined as 'a feature that allows for what evolutionary scientists refer to as random, accidental, or chance occurrences'[262]. Haught is well-acquainted with the notion of chance. In an earlier work, he carefully distinguished five meanings it could take: epistemological (to refer to our current ignorance – chance is hence an illusion that should be cleared up in the future); mathematical (chance occurrences being deviations from statistical regularities calculated from laws of probability); existential (when an *a priori* unimportant event – at the intersection of two independent causal series – is given a special relevance due to a human involvement); physical (when an event is unpredictable in principle – only found at the subatomic level); and metaphysical (when Chance is quasi-synonym of God in the person's philosophical system)[263]. However, he consciously shifts 'the chance vs design argument to a new plane of discussion, that of order vs novelty'[264]. The former has indeed proven fruitless (a statement that is still true today), because it is too close to the old debate between God as order and human freedom. Although for very different reasons, Haught, like Dawkins, refuses the chance/design debate because it is not the proper couple to oppose.

In Haught's perspective, order, as we have seen, is provided by information, with its ultimate source being God. However, throwing in our latest theological development – God's infinite love for the world giving it is freedom to evolve – means that God is not only the ultimate source of order, but also of novelty – i.e. of new orders, arrangements or patterns. Haught initially defined chance occurrences as deviations from the pre-existing sorts of orders, leading to the emergence of a more complex order – of a new phase in the world's evolutionary story[265]. Indeterminacy was then the necessary resistance opposed by nature to the new arrangements it receives, preventing it from returning to its ordering principle – God. He now preferentially refers to contingency as 'nature's fundamental openness to new creation' or novelty, a characteristic that would be expected in an unfinished world progressing toward its completion[266]. Curiously, in one of his few quotes of pre-modern

[261] *Christianity and Science*, p. 94.
[262] *God After Darwin*, p. 100.
[263] *The Cosmic Adventure*, p. 78-81.
[264] *The Cosmic Adventure*, p. 82.
[265] *The Cosmic Adventure*, p. 83-85.
[266] *God After Darwin*, p. 100. See also *Responses to 101 Questions About God and Evolution*, p. 137. Haught once used a completely different meaning of contingency: since the existence of the world is unnecessary (contrary to God's), it is, by essence, contingent – and hence has to accept some kind of chance events. See *Darwin, Design and Divine Providence*, p. 242.

theologians, Haught calls for the support of Thomas Aquinas, when the Angelic Doctor proclaimed that 'divine providence does not take away fortune and chance from things'[267]. However, when Thomas argues that chance is not opposed to divine providence, he explicitly and repeatedly states that providence preserves the perfection of things, going as far as mentioning the perfection of the universe – whereas Haught himself is all set about convincing us that the world is both unfinished and imperfect.

Notwithstanding Thomas, Haught considers that contingency – that novelty – is necessary for the world to simply be alive. Otherwise, it would be 'so stifled by lawful necessity that everything in it would be eternally dead'[268]. It logically ensues that 'as the ultimate source of novelty in evolution, God must also be the cause of instability and disorder, conditions essential to life'[269] and to the processes of ordering and reordering. Reducing God to a provider of order – of design – is highly inappropriate – here lies the major theological argument against IDT, but also against most scientific materialists. Design is too narrow, too frail, and too fragile – Haught uses all these epithets – to refer to divine action[270]. Moreover, by refusing to look at the darker side of evolution – the struggle and suffering – ID theorists neglect the 'tragic depth' of nature – life is 'too rich and mysterious' to be restricted to intelligence[271].

If contingency is required to ensure the universe's aliveness against a strict determinism, laws are on the other hand mandatory both to prevent nature's decay into pure chaos and to grant it the ability to construct a certain consistency, independence and self-reliance of the universe. In other words, no novelty could ever arise were it not for the existence of laws – for without laws there is no established order, and without pre-existing order there can be no novelty. Contingency and laws are two sides of the same coin – they are equally necessary for evolution. Eventually, the world must be allowed a large amount of time – the last of the three 'Darwinian ingredients' – in order to explore all the evolving possibilities it has been

[267] THOMAS AQUINAS, *Contra Gentiles*, III, 74, 1. See the whole question 74.
[268] *Christianity and Science*, p. 94.
[269] *God After Darwin*, p. 42.
[270] *God After Darwin*, p. 42; *Is Nature Enough?*, p. 101. See also, *Responses to 101 Questions About God and Evolution*, p. 86-89. Interestingly, Haught already opposed the idea of God as a Designer before the commonly given birth date of IDT, since he stated in *The Cosmic Adventure* in 1984 that God does not impose order on the world: He only proposes possible patterns that nature is then at liberty to actualize, concluding that 'the term 'Designer' seems inappropriate as the primary image of this metaphysical principle' (p. 84).
[271] *Deeper than Darwin*, p. 100-102.

endowed with by its creator[272]. The long course of evolution is rendered compulsory by the very freedom God has allotted the world[273].

Tying all three elements together leads Haught to describe his ontological perspective as 'the coming of the future'[274]. Contrary to what scientific materialists believe, it is not the past that drives evolution – certainly not a mindless, purposeless one – but the arrival of a new future, i.e. ultimately of God. Evolution is given all its sense in this ontology of the future – as opposed to the materialistic ontology of the past, or of death, since the past, in their mindset, is made up only of lifeless matter[275]. Such ontology would also prove useful to science, since it would provide 'an open-ended and more realistic framework for the ongoing adventure of scientific discovery' than materialism[276]. More importantly in Haught's eyes, though, the ontology of future enables him to draw an ideal background in which to discuss divine providence and cosmic purpose, our last two concepts of interest.

E. Building a theology of evolution: divine Providence, beauty and purpose

Haught understands providence in a classical manner, discriminating 'between general Providence, God's care for the universe as a whole, and particular Providence, God's involvement in a specific event or in an individual's life'[277]. He usually does not precise which one he is discussing, but his indifferent use of the expressions 'divine providence' or 'providence' (capitalized or not) points to a global focus on the former, which seems indeed more in phase with his proposition of a universal theology of evolution. His formulation remains voluntary vague: as always, 'we must not be too simplistic in trying to understand how divine care manifests itself'[278].

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[272] *Deeper than Darwin*, p. 102-104; *Christianity and Science*, p. 94. See also *Responses to 101 Questions About God and Evolution*, p. 104-105, where Haught discusses the characterization of natural selection as an 'impersonal law' and its subsequent opposition to divine providence. He deems it completely unnecessary, other impersonal laws such as gravity does not lead to any theological bothers.

[273] *Responses to 101 Questions About God and Evolution*, p. 111-112.

[274] *Christianity and Science*, p. 95. A variant is 'the arrival of the future', *God After Darwin*, p. 103. See also p. 114-119 for a discussion about the relations between God, the world as a promise and the future. Haught's ontology of the future is also influenced by Teilhard de Chardin's own conception of God as the Omega toward whom we are going rather than the Alpha who created us *ex nihilo* (*Deeper than Darwin*, p. 162-164).

[275] *God After Darwin*, p. 86-87 and 91-93; *Christianity and Science*, p. 16 and 149-151. At some point, Haught curiously praises the future as the only way of 'pushing the present into the past' without which there would be 'consequently no temporal sequence of moments in which evolution could occur' (p. 103).

[276] *God After Darwin*, p. 93.

[277] *Darwin, Design and Divine Providence*, p. 244.

[278] *Responses to 101 Questions About God and Evolution*, p. 100. A similar definition of providence is given there. See also p. 99-102.

Readily acknowledging the irreconcilability of evolution and divine providence as brought forward by many scientists and religious thinkers, Haught notes that this issue has been met in five different ways[279]: evolution has proven the inexistence of providence; the work of providence has been restricted to the cosmic organization of the universe (an example being the theological interpretation of the anthropic principle); providence is a form of divine pedagogy (God's 'tough love' for the world would then partially explain its suffering); providence is manifested through cosmic trends (toward a cosmic purpose rather than in a definite manner); providence is expressed through Darwinian contingency, lawfulness and deep time (it is using them to build an autonomous and self-reliant cosmos). Haught immediately (and obviously) disagrees with the first one; similarly, he considers that a purely fiduciary answer – even if the face of all evolutionary arguments, providence should still be believed in out of pure trust and faith in God – is unsatisfying, as it is more a blind tolerance of the unavoidable rather than an embrace of the contemporary worldview. He only cautiously assents to the second position, which is less relevant to our debate anyway since it appears only significant for cosmic origin and early history. The third appears interesting and is even biblically grounded, but does not fit into his wide understanding of salvation as applying to the whole universe – not only does it diminish the importance of pre-human history, but Haught fails to see why other sentient beings should suffer with us. He is more favorable to the last two propositions, which are not mutually exclusive and which he considers to be simultaneously true.

The fifth one corresponds to what we have just exposed – divine providence is at work through evolution, since contingency as openness to novelty, lawfulness as protection against chaos and road to consistency, and abundant time as exploratory era, are concurrently required to nature's self-actualization autonomously from its creator. Freedom to evolve is a prime example of how God's care is persuasive, not coercive, and how He humbly withdrew himself to let His creation be. What this conception of providence misses is a purpose – the world is allowed to become itself not for the sake of dialoguing with God, but toward a specific purpose[280]. This purpose is given by the fourth position, which is once again embedded in process theology, in the works of Teilhard de Chardin and Whitehead in

[279] The article *Darwin and Contemporary Theology* is dedicated to the topic of divine providence in a post-Darwin mindset. See also *Christianity and Science*, p. 88-90 and 95-96.

[280] Although Haught once noted, after stating that theology was currently unable to answer why God has created a narrative world, i.e. whose history was constantly changing and hence could be told in a story mode: 'Is it perhaps because God love stories ? And not only small stories, but large ones also ?' (*Deeper than Darwin*, p. 63).

particular[281]. Haught insists on the difference between purpose and design – the former is much wider and can encompass chance and disorder, contrary to the 'all too simple' latter[282]. Providence is not restricted to design either; rather than a strict plan that would be incompatible with his gift of freedom, the God of evolution has a vision of the future – or, as Haught prefers to say, he gave a promise of what is to come – we are indeed in an ontology of the future[283]. This means that evolution, if one understands 'purpose' in the rigid way of 'heading straight toward a goal fixed from all eternity', is indeed purposeless. Direction must be looked for at a higher, wider level – the entire cosmos[284].

Haught notes that when one is looking back to the world's history, there is an obvious directionality from simplicity to complexity – toward a higher level of orders[285]. Borrowing Whiteheadian terms, he consequently describes purpose as the constant 'ordering of novelty' – i.e. beauty, which Whitehead also labelled as 'the harmony of contrast'[286]. Haught generally defines purpose as 'oriented toward a goal or toward a value': 'a process is called purposeful or 'teleological' if it tends toward the realization of some good, rather than just meandering blindly about'[287]. Why purpose for him essentially entails value is unfortunately left unexplained; while it might be understandable if this definition was restricted to cosmic purpose, which might be characterized as being inherently good due to its origin in God, such reservation never occurs.

Nevertheless, beauty historically qualifies as a transcendental value, along with goodness and truth; furthermore, it is one of the abovementioned primal fields of knowing, a commendatory road toward nature's depth[288]. As such, it indeed proves an excellent metaphysical candidate. Haught epitomizes his position in his 'aesthetic cosmological principle', which states that 'the universe has been set up, as it were, from the very beginning in such a manner as to allow for the ongoing creation of beauty'[289]. The universe as a wide display of beauty provides another explanation for suffering – beauty as ordering of novelty

[281] Haught professes a great admiration for process theology, as well as for Paul Tillich's theology. See e.g. *God After Darwin*, p. 81-83; *Responses to 101 Questions on God and Evolution*, p.133-143; *Deeper than Darwin*, p. 161-175; *Christianity and Science*, p. 65-81. Haught dedicated a full book to both Teilhard de Chardin and Tillich, *In Search of a God of Evolution*.
[282] *God After Darwin*, p. 106.
[283] *Responses to 101 Questions on God and Evolution*, p.112-113. See also *God After Darwin*, p. 111-114.
[284] *Responses to 101 Questions on God and Evolution*, p.109-111.
[285] *God After Darwin*, p. 117.
[286] *Science and Religion*, p. 179; *God After Darwin*, p. 131 (see p.126-132).
[287] Both references come from *Science and Religion*, p. 164. Haught refers to the Aristotelian final cause as well.
[288] *Science and Religion*, p. 179; *Is Nature Enough?*, p. 46-47.
[289] *God After Darwin*, p. 128. See also *Responses to 101 Questions on God and Evolution*, p.111 and 170; *Christianity and Science*, p. 59-64.

suggests a constant balance between order and disorder toward an ever-growing level of order. The aesthetic principle is henceforth fully consistent with the classical theological conceptions of the cosmos as existing for God's glory and of God as the ultimate in beauty[290]: this particular characterization of creation's end is therefore only another way to describe its Absolute Future, i.e. God. In this cosmic perspective, the purpose of our own lives is clear (at least in the metaphysical level): we have 'to carry forward in whatever way we can the universe's general creative aim toward deeper and wider beauty'[291]. How this applies to everyday morality is less evident, though Haught at least includes an ecological concern[292].

Finally, Haught took care to demonstrate why cosmic purpose could not be detectable at the scientific level – and indeed should not even be looked for there. Purpose, like meaning and other values, lies at the level of mind, which he deems higher than the level of matter; as we have seen, higher levels give sense to lower levels without interfering and without being inducible through the sole consideration of these lower levels. Cosmic purpose, quite logically, is as unobtrusive as any higher level, and cannot be demonstrated by any kind of scientific experiment. We are unable to grasp it and can only attempt to be left open in order to be grasped by it – a mindset Haught describes as distinctive of faith[293]. We have come now to a full circle: purpose is not one of the many nature's features that can be studied by scientific method, for it is in too deep a level, one that is preserved for theology. Theology does not confront science, it completes it.

Haught's conception of contingency in evolution has led him to renovate his vision of purpose and providence, which he prefers to the too narrow notion of design, and to adapt his whole theological framework. One may, or may not, agree with his religious interpretations of nature and scientific theories and with his coarse dismissal of scientific materialism, but contrary to creationists, materialists and ID theorists, Haught, at least, consciously discriminates between his knowledge of scientific results and his metaphysical considerations. After all, one would expect no less from a theologian so keen on categorization and hierarchization.

[290] *God After Darwin*, p. 130.
[291] *Responses to 101 Questions on God and Evolution*, p.142-143.
[292] Haught's morality appears quite traditional. For a discussion, see *God After Darwin*, p.121-144 and *Is Nature Enough?*, p.143-166.
[293] This paragraph summarizes Haught's development in *The Cosmic Adventure*, p. 88-97.

V. Tying it all together: chance and design in evolution and theology

A. A brief recapitulation

Let us now recapitulate what has been discussed at length in the previous chapters. Our issue of interest – the oft-opposed place of chance and design in evolution – occurred to Darwin himself whilst he was maturing his theory as early as the 1830s. His conflict arose from his peculiar comprehension of chance and especially design, a predicament still much encountered today. Therefore, we endeavored to discriminate the different meanings of chance and design relevant to our topic. Chance can be ascribed several senses, possibly referring to luck or coincidence (unexpected phenomena or outcomes, with or without an added sense of leading to a positive or negative outcome), accidental occurrences (Cournot's definition of uncorrelation as the intersection of at least two independent causal series), statistical randomness (related to probability laws and hence a certain level of predictability) or pure indeterminism (due to theoretical unpredictability); in a more philosophical context, it can also characterize currently unexplainable processes. Design, on the other hand, is often used as a metonymy for divine providence – God's continuous care for His creation – and understood through the double notion of *creatio ex principio* and *creatio continua*; it is commonly discussed with the subsidiary issues of evil, suffering, human autonomy and the extent of divine interventions. Finally, design ought not to be confused with finality, or the acting of an agent toward an end, be it to achieve a conscious purpose or to follow the agent's nature's commands; whereas finality differs from deliberation and can be understood in a mechanistic fashion, the concept of design indeed readily implies the existence of a designer.

Afterwards, we analyzed four current ideologies regarding evolutionary theory and its chance proportion. We began with scientific creationism, a standpoint which emerged from American Protestant fundamentalism in the middle of the 20th century in order to counterattack Neo-Darwinism on scientific grounds. However, their claim to do science has since long been refuted and their arguments have been found wanting. Furthermore, no mystery is made of their religious premises and of their political aim to eradicate evolutionary theory and purify society from its alleged evil consequences. Denied the title of science, evolution is considered a chance process at all levels; the emergence of complex structures at once becomes hence utterly improbable. Creationists' understanding of chance remains vague; it seems to be equated with indeterminism or chaos and opposed to order or design,

which label the organisms' inner organization as well as – for design – the divine plan for nature towards its divinely predetermined purpose. The extent of providence is not discussed either, but divine care includes all living beings and even inanimate objects. The debate is here clearly set between chance and design – between the supposedly antithetical worldviews of evolution and Christianity.

Scientific materialists, on the other hand, believe that evolution has rendered religion obsolete. Contrary to creationists, their scientific premises are beyond reproach and in agreement with current Neo-Darwinist theories. Therefore, the two main steps of evolutionary process – mutations and natural selection – must be distinguished whilst discussing chance in evolution. Although their occurrence *per se* is not a chance event, mutations can be described as random with respect to natural selection as their emergence is uncorrelated to the environment and hence to their possible impact on their organism's fitness. Natural selection, on the other hand, is definitely a nonrandom process given its dependence to the organism's milieu. An additional role of chance is found in the happenstance of accidental events such as mass extinctions, whose influence on evolutionary history is still under discussion. The comprehension of design is more variable; while it is always associated with the intention of a supernatural designer by Richard Dawkins, it is closer to our initial delimitation of finality in Daniel Dennett's mind, who defines it as the use of order toward a purpose, namely the organism's adaptation to its environment in an evolutionary context. Both scholars nevertheless consider evolution to be mindless and purposeless and reject the existence of a Designer and of a providential care; albeit not scientific *stricto sensu*, the immense amount of suffering and death in nature is also used as an argument against a benevolent designer such as the Christian God. Like creationists, materialists consider evolution and Christianity to be mutually incompatible; however, the controversy is not put between chance and design, but between evolution, a chance and law process, and design.

The position we examined next was the Intelligent Design Theory (IDT), a movement born out of creationism at the end of the 20th century and once again overtly attempting to evict Neo-Darwinism. IDT accommodates a very wide array of metaphysical postures, ranging from the acceptance of Neo-Darwinism including common descent to open Young-Earth Creationists, and whose common aim seems to provide empirical demonstrations of the existence of design and hence of a designer. Although the identity of this designer is carefully left blank when arguing for the scientificity of IDT, he is nearly always and often positively assimilated with the Christian God. A prominent illustration is William Dembski's

complexity-specification criterion and law of conservation of information, which state that if a system is simultaneously contingent (or unnecessary), complex (or improbable) and specified (or corresponding to a pre-determined pattern), then it cannot be the outcome of natural laws nor chance and must have been designed. Such reasoning, whose principle is strikingly similar to creationists' and which is embedded into expositions of Christian theology, depends on mutually exclusive definitions of chance and design, the former encompassing all natural causes and the latter simultaneously referring to an organism's inner structure, the designer's blueprint in nature and the designer himself. Such specific and self-serving comprehensions also lay foundation for another ID supporter's theory, Michael Behe, who asserts the existence of irreducibly complex molecular machines unexplainable by evolutionary theory, an expected conclusion given his holistic definition of these systems and his *a priori* rejection of any model proposing a stepwise emergence – which lies at the very core of evolution. A metaphysical theory with no real scientific background and projects, IDT resets the debate between chance and design, between evolution and religion, which is forthrightly identified with Christianity in the American context.

Last but not least, we reviewed a completely different kind of perspective – theistic evolution as proposed by John Haught. Far from steering the contention into scientific or theological grounds, Haught forcefully insists on the distinct sorts of explanations provided by science and philosophy or theology: natural mechanisms and processes for the former, the ultimate explanation for the latter. Building on this relatively old distinction between the hows and the whys, the theologian develops a theory of information as permeating lower levels from above while remaining unobtrusive and undetectable – a biological example could be the information carried on by DNA, perceptible at the molecular level but without influence on nor inducible from an atomic analysis. Similarly, divine providence and purpose are not observable at the scientific level, while theology is fit to discern them – creationists, ID theorists and materialists all fail to grasp this nuance, a fault labeled as explanatory monism. This dichotomy allows Haught to integrate evolutionary theory into a new theological framework emphasizing the continuous creation of the world, which enables it to accommodate God's progressive auto-revelation, and Christ's assumption of the suffering of all creatures, not only humans, extending Redemption to the whole cosmos. Furthermore, God's love for His creation implies it has been bestowed with freedom and autonomy in order to properly become itself, that is to say a nature with which God could dialogue over time; God's power is one of persuasion, not coercion. Consequently, evolution is only the manner

through which the world thrives; chance, which Haught mostly defines as contingency or the openness to new kinds of orders, i.e. to novelty, is necessary for this freedom to be effective. Design is of no interest to Haught; God is no designer, He is the ultimate source of nature's order and novelty. The theologian is keener on providence, which is manifested through evolution, and in cosmic purpose, which he considers to be the maximization of order, namely beauty. The depiction of beauty as a subjective field of knowing separate from objective theory reminds us of the innate inability of science to reach that particular level, which is reserved to theology. Haught hence refuses to see any issue between chance and design, or even evolution and design: God's providence blends both purpose and evolution as chance, law and time.

In other words, scientific creationism and IDT are certainly not science despite their claims, if only for their lack of respect for scientific methodology and their obvious political and religious premises and aims, but also for their specious understanding of the role played by chance in evolution, while their comprehension of design is theologically controversial. Their scientific future is void; however, fuelled by their virulent oppugnancy to Neo-Darwinism, their supporters will doubtlessly pursue their crusade under a guise or another.

On the other hand, scientific materialism ought to be put in another category due to the accuracy of its knowledge of (chance in) evolutionary theory; nevertheless, the improper transfer of scientific results into metaphysics is unjustified – an empirical absence of purpose so far is no definite proof of its sheer inexistence in principle. As a matter of fact, this translation appears to stem more from the hope of his proponents to achieve the Enlightenment project: 'if the principles and methods of Reason were only explained clearly enough, religion would lose the tremendous, almost wholly harmful and destructive power that it has over individuals and over society'[294]. To our opinion, the current version of scientific materialism – the new atheism – arose in opposition to and was progressively radicalized against religious fundamentalism regarding science, primarily scientific creationism and subsequently IDT. Whether the best way to defend scientific freedom and autonomy consists in attempting to annihilate religion as potential fundamentalism, which could provoke an instinctive rejection of anything related to the new atheism (including evolution), or whether it lies in trying to build a dialogue with the moderate scholars of both sides, which could be misconstrued as an admission of weakness and as a false compromise,

[294] A. LUSTIG, *Natural Atheology*, p. 80.

is heatedly debated, among others between Dawkins, Dennett and Ruse[295]. What remains certain is that the new atheists will uphold their stand at least as long as religious fundamentalists keep on their fighting – presumably for a very long time.

Lying in the middle ground, Haught's theology of evolution offers a carefully balanced arrangement of scientific data and theological interpretations proving the fundamental compatibility of, and even transcending the antagonism of, chance and design in evolution. Such a task is not effortlessly achieved, for it requires proper knowledge in both science and theology. Moreover, Haught's proposed renewal of theology extends beyond the scope of the science/theology dialogue; though untouched by the theologian, its impact on *a priori* unrelated topics, such as the mutual relations between man and women, may prove substantial. In that perspective, topics for further research would include the influence of the integration of evolution in theology on other current theological issues and a comparison of Haught's theistic evolution with other theological postures within the same framework, such as theologian Alistair McGrath or – with the additional implication of the importance of a prior scientific education – physicist-turned-theologian John Polkinghorne or biologist Francis Collins.

B. Further considerations on the specificity of a theology of evolution

In order to highlight the peculiarities of Haught's propositions, it proves interesting to compare them to the vision of Christoph Cardinal Schönborn – mentioned in passing in our introduction – and of Benedict XVI, of whom Schönborn is both an ancient student and a confidant. Schönborn's opinions on evolution were not expressed only in the short New York Times (NYT) article; they were also developed in monthly conferences (or catechetical lectures) in Vienna's St Stephen's Cathedral in 2005-2006, which were later published in a book named *Chance or Purpose? Creation, Evolution and a Rational Faith* (2007). Furthermore, *Creation and Evolution* was the topic of the 2006 yearly gathering of Benedict XVI's ancient students; it was animated by the Cardinal and partially attended by the Pope, and the presentations and subsequent debates are available as well[296]. Beside papal allocutions, they allow for a more direct and private insight into the Pope's perspective on

[295] See G. KOCH, *Full of Sound and Fury: The Media Response to Dennett* for a more comprehensive presentation.

[296] A slightly revised version of Schönborn's presentation at the symposium (*Fides Ratio, Scientia,* in Ch. SCHÖNBORN, *Création et évolution*, p. 97-123), but not his participation in the debates, has been published as a separate article (*Reasonable Science, Reasonable Faith*). The first six catechetical lectures are also available in English on the website of the Archdiocese of Vienna. All subsequent quotations will come either from the article or from the official translations.

evolution than the official *Communion and Stewardship* from the International Theological Commission.

Schönborn explicitly distances himself from creationism for its literal reading of the Bible – it is no scientific textbook; asserting a young Earth is 'simply nonsense' and attempting to prove it scientifically is only provoking the *irrisio infidelium*, the scorn of the unbelievers, and should be forbidden[297]. Quoting Thomas Aquinas and appealing at length to Benedict XVI, the Cardinal presses on the compatibility of faith and reason and on the actual requirement of reason by religion to avoid falling into fideism. The conflict only arises when scientists themselves transform their findings into a metaphysical perspective, the battlefield lying henceforth lying philosophy and not science[298]. Along with the Pope, Schönborn conventionally pursues by declaring materialism utterly irrational and by asservating the sheer impossibility of the emergence of mind, reason and values from inanimate matter, contrary to the 'presumptions' of evolutionary theory[299]. Once again, the trust displayed by materialists in their reasoning abilities is ungrounded, their refusal to see beyond matter is dogmatic, and their real debate is set between materialism and Christianity – or, as the latter takes the Logos as foundation, between irrationalism and rationalism.

So far, these stances could have been excerpted from one of Haught's books. Howbeit, Haught disagreed with Schönborn's closure that accepting 'arbitrary chance' as a key player in evolution therefore becomes an 'abdication of reason' – leaving as only alternatives the endowing of Evolution with a mythical creating power or accepting God as the ultimate origin of the universe, life, and principally mankind[300]. Not only is chance – contingency – compatible with divine providence, but even if the ultimate source of evolution is God (on which both agree), it is not the role of chance that should lead to that conclusion, but the openness to transcendence, i.e. faith[301]. Schönborn's comprehension of chance seems blurry; even in his attempt to clarify his initial article in the NYT, he fails to define it clearly, merely stating that 'the randomness in Neo-Darwinian biology is nothing like that [mathematical

[297] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 28. See p. 26-28 and 46-47 (second and third lectures).
[298] Ch. SCHÖNBORN, *Hasard ou plan de Dieu ?*, p. 15-21 (first lecture). See also a quotation of Josef Ratzinger's allocution in a symposium dedicated to evolution and Christianity in 1986, in Ch. SCHÖNBORN, *Création et évolution*, p. 8-11.
[299] Ch. SCHÖNBORN, *Hasard ou plan de Dieu ?*, p. 108. See p. 107-111 (sixth lecture), Ch. Schönborn, *Reasonable Science, Reasonable Faith*, p. 23-24 and a quotation of an 1999 allocution of Josef Ratzinger in Ch. SCHÖNBORN, *Création et évolution*, p. 19-25.
[300] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 78. See p. 49-53 and 75-78 (third and fourth lectures).
[301] J. HAUGHT, *Darwin and the Cardinal*.

randomness]. It is simply random'[302]. Such haziness is even more bewildering given that biological randomness as uncorrelation – the comprehension against which Schönborn was reacting and which he so straightforwardly dismissed as superficial – would be confirmed during the 2006 gathering by the scientist on duty[303]. In any case, Schönborn's conclusions would probably be heartily agreed with by creationists and ID theorists: 'Yet out of all that unconstrained, unintelligible mess emerges, *deus ex machina*, the precisely ordered and extraordinarily intelligible world of living organisms. And this is the heart of the neo-Darwinian science of biology'[304]. To our surprise, such an unequivocal assimilation of evolution with chance is also found explicitly in one of Benedict XVI's allocutions: 'How many these 'some people' are today! Deceived by atheism they consider and seek to prove that it is scientific to think that all things lack guidance and order as though they were at the mercy of chance'[305].

The Cardinal's reception of IDT is likewise much more ambiguous than Haught's. Although he forewarns against the immediate search for intelligent design to serve apologetic aims[306], he seems rather sympathetic to the movement, commenting on the undeserved and unscientific aggressiveness of scientists toward ID theorists, who have every right to raise their fundamental questions[307]. Schönborn appears as undecided regarding the argument of design, managing to remind his readers that God is no engineer-like designer but the Creator of autonomous beings whilst proffering that 'a time-piece does not come into being by accident, even less so the living organism that is a plant, an animal, or, above all, man'[308]. Elsewhere, he cites Thomas' comparison of nature with technique and concludes that 'the existence of a ship leads to the question 'Who constructed it?' – and so the self-evident experience of nature (as being directed toward an end, as ordered, and as beautiful) leads to the question 'Where do these marks of intelligence come from?''[309]. Haught criticized this seemingly overall acceptation of ID tenets, calling it 'a setback in the dialogue of science and religion' and fearing that Schönborn's words will be quoted *at nauseam* by ID theorists and creationists[310]. In our eyes, Haught, who strongly advocates in favor of scientific

[302] Ch. SCHÖNBORN, *The Designs of Science*, p. 36. This article is a reply to Stephen Barr's criticism.
[303] P. SCHUSTER, in Ch. SCHÖNBORN, *Création et évolution*, p. 134-135.
[304] Ch. SCHÖNBORN, *The Designs of Science*, p. 36.
[305] BENEDICT XVI, *General Audience (Wednesday, 9 November 2005)*, quoting Basil the Great.
[306] Ch. SCHÖNBORN, *Reasonable Science, Reasonable Faith*, p. 26.
[307] Ch. SCHÖNBORN, *Hasard ou plan de Dieu ?*, p. 141 (ninth lecture).
[308] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 86-89and 24 respectively (fifth and first lectures).
[309] Ch. SCHÖNBORN, *Reasonable Science, Reasonable Faith*, p. 24.
[310] J. HAUGHT, *Darwin and the Cardinal*.

independence, would be similarly aghast at Schönborn's appalling indignation regarding the lack of freedom in evolution debates and the enforcement by the scientific community of 'a type of censorship similar to that for which the Church is similarly reproached'[311]. The Cardinal goes as far as commenting that even if creationism itself is unscientific, asking that 'the critical questions that have been raised with regard to Darwinism' be discussed in science courses is a 'reasonable and legitimate concern'[312]. Knowing that Schönborn has in mind 'consequences' such as sociobiology, which have been rejected for being philosophy and not science, whereas he continuously castigates the inability of scientists to restrain their conclusions to their fields of work, this is quite the irony.

Schönborn accordingly revels in the alleged inadequacy of Neo-Darwinism, mentioning missing links (creationists' pet case), the inability to observe macroevolution (unsurprisingly), the impossibility for a whole living system to transform into another one through minor mutations (an argument which sounds suspiciously similar to Behe's irreducible complexity) and, of course, mass extinctions[313]. In a marked contrast with Haught's respect for scientific pace, Schönborn oddly gushes about the fact that no other scientific theory has so many question marks – preemptively unaware that physicists are still looking for a unifying theory able to explain both the infinitely big and the infinitely small. While the Cardinal has every right to discuss the weaknesses of scientific theories as a person, one fails to see their relevance to his criticism of materialism, especially provided that his expertise as a theologian does not equip him with the necessary background to fully apprehend them[314].

On the other hand, Christoph Schönborn and Benedict XVI appear at least to share a vision of divine providence and purpose similar to Haught's. The emphasis is indeed put on the *creatio continua* as denoting a conception of existence as essentially dynamic rather than static and of creation as becoming rather than being, a vision henceforward entirely compatible with an evolutionary perspective[315]. Furthermore, the absolute freedom of God's constant creative act means that He has endowed us with freedom: 'since God creates in

[311] Ch. SCHÖNBORN, *Reasonable Science, Reasonable Faith*, p. 23.
[312] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 28. See also p. 144-148 (second and ninth lectures).
[313] See e.g. Ch. SCHÖNBORN, *Création et évolution*, p. 120. This paragraph has been omitted in *Reasonable Science, Reasonable Faith*.
[314] His critics of scientific results are often inexact and sometimes even wrong. For instance, he once noted the lack of scientific criteria to differentiate species to weaken Neo-Darwinism, apparently ignorant of evolutionary genomics and its use of the extent of divergence between genomes to calculate phylogenetical trees and hence discriminate between species (Ch. SCHÖNBORN, *Reasonable Science, Reasonable Faith*, p. 25).
[315] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 37-38 (second lecture) ; quotation of a 1968 course by Josef Ratzinger in Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 12-14.

sovereign freedom, He gives His creatures the sovereign freedom to be themselves. Since He has no other reason for creating than His own goodness, He gives His creatures a share in His goodness: 'and God saw that it was good.''[316] We are born out of God's will, not out of necessity; therefore, He created us with a purpose in mind and cares for us through His divine providence. The divine project is one of love, and love entails freedom and suffering – here are found Haughtian descriptions of love such as 'letting go' and 'gift of oneself'[317]. Within this perspective, '[our] important mission is to discover this meaning, to live it and thereby contribute a new element to the great cosmic harmony conceived of by the Creator'[318]. Furthermore, the cosmos was created in order to glorify God, an end visible through the sheer amount of beauty observable in nature and which is passed over by Neo-Darwinian science – a conception quite reminiscent of Haught's[319]. The universe's ultimate finality lies in Christ, the Resurrection and the Second Coming, and 'it is only through God's self-revelation in Christ, and our response of faith, that we can begin to glimpse the ultimate purpose of the cosmos and to trust in God's provident care of all cosmic details'[320]. As in Haught's theology, faith is essential to detect divine purpose where it seems absent, as science is unqualified in that matter: 'in the debate about design in nature, *sola fides* takes on an entirely new meaning'[321]. And that it does: Schönborn pursues on boasting that his argument thereabout 'was superior to a 'scientific' argument since it was based on more certain and enduring truths and principles'[322], referring to his well-deserved trust in his intelligence as opposed to the materialists' in their own.

C. Concluding notes: evolution and the science/theology dialogue

This brief presentation of Schönborn's positions along with Haught's yields several remarks. First of all, we are impressed by Haught's indisputable rejection of scientific creationism and IDT and his willingness to give science its complete independence, a posture apparently not as common as one would expect. Independently of any theological debates regarding his

[316] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 40 (second lecture).
[317] BENEDICT XVI, *Meeting of the Holy Father with the clergy of the dioceses of Bellurno-Feltre and Treviso*. These expressions were applied to human love and, by extension, to God's love. In addition, Schönborn too ponders in his catechetical lectures, on evil and suffering, on the specificity of mankind and its responsibility toward nature, three topics also related to creation and renewed by evolution in Haught's theology.
[318] BENEDICT XVI, *Meeting of the Holy Father with the clergy of the dioceses of Bellurno-Feltre and Treviso.*
[319] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 60-61 (third lecture) ; BENEDICT XVI, *General Audience (Wednesday, 9 November 2005)*, who quotes again Basil the Great: 'what beauty there is in this order !'.
[320] Ch. SCHÖNBORN, *Reasonable Science, Reasonable Faith*, p. 26. See also Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 120-121 (seventh lecture).
[321] Ch. SCHÖNBORN, *The Designs of Science*, p. 37.
[322] Ch. SCHÖNBORN, *The Designs of Science*, p. 37.

propositions, his integration of evolution into theology, especially through his vision of a constantly changing world, grabs our attention. Haught's assenting posture is indubitably influenced by process theology, in whose perspective his work is voluntarily posited; this difference of background may also account, at least partially, for his many divergences with Schönborn, whose reflexion is patently set in Neo-Thomism. He is indeed given away by the constant use of Aristotelian categories such as matter and form, whose concept must absolutely be 'recaptured' in order to overcome materialism, as the realization that 'everything living discloses itself as form, as the expression of an internal principle that is more than its material components' is required for science to continue: 'the exploration of biochemical detail can methodologically prescind from the question regarding form, but, in the long run, if it does not wish to devolve into blind science, it cannot neglect inquiry into what makes plants, dogs, etc., into that which they themselves are'[323]. Similarly, the Cardinal blames evolution for immerging man within the flux of life, thereby unsettling his top position as sole sentient being, but also for 'blurring' every creature's own reality, antagonistically to 'the belief in creation, according to which all creatures have their own being, their own form, their own power of acting, and, in the case of human beings, their own freedom'[324]. All in all, it appears that the metaphysical perspective of a static, unchanging world is has become unfit to accurately describe nature and its history, a conclusion yet unreached more often than not.

Likewise, we find highly commendable his and Schönborn's urging to avoid confusion between science and scientism, a task that is admittedly impeded by the innate tendency of scientists – like any scholars – to apply their knowledge and methodology outside of their research; Haught himself doubtfully commented on its difficulty, though he was not talking about his personal works at the time[325]. That said we found their comprehension of scientific theories somewhat wanting and often coarse. Although he has stopped venturing as far in science as Schönborn, Haught also showed some inadequacy in his examples, e.g. regarding recent developments in evolutionary psychology and the emergence of intelligence in great apes[326]. Nonetheless, the mere acceptance of the idea of evolution and three of its core components falls short. We of course do not condone basing theology on specific scientific theories, a dangerous exercise since they are bound to change over time and which would be breaking Haught's careful separation of scientific and theological understandings. However,

[323] All three quotations come from Ch. SCHÖNBORN, *Reasonable Science, Reasonable Faith*, p. 25.
[324] Ch. SCHÖNBORN, *Hasard ou plan de Dieu?*, p. 40 (second lecture). See also p. 36-41.
[325] J. HAUGHT, *Can a Darwinian Be a Christian ?* (review), p. 39.
[326] See e.g. R. DUNBAR and L. BARRETT (eds.), *The Oxford Handbook of Evolutionary Psychology*.

other aspects of evolutionary theory are crucial and should be part of any attempt to integrate evolution into theology, mostly adaptation and selection[327]. Haught himself noted that theology must be scientifically up-to-date; it is a stance we wish to reinforce as it bears a great influence on theological frameworks, conspicuously in a scientifically-based domain like chance in evolution.

Another point we are somehow dissatisfied with is the rather disdainful dismissal of materialism as irrational or self-contradictory. This line of reasoning has already been applied to faith countless times and systematically rejected as irrelevant since faith is open to reason; in that perspective, materialism is nothing but reason itself. As already mentioned, the central argument – mind cannot come from matter – resembles too much a petition a principle to be conclusive; Dennett's short answer – 'why should the importance or excellence of anything have to rain down on it from on high, from something more important, a gift from God?'[328] – has never even been addressed. In all cases, this typical argument of personal incredulity will never convince any materialist – more than an appeal to faith under any name would be necessary. The same could be said regarding rebuff of materialism for its supposed nihilistic or anti-humanistic implications: the consequences of a theory do not bear on its truth[329]. In an issue centered on the scientific meanings of concepts like chance and purpose, it might not prove wise to simply call into question the intelligence of one's interlocutors.

We remain likewise unconvinced by the influence on scientists of these essays, which appear more aimed toward theologians or sympathetic readers than toward materialists. This is a missed opportunity: despite frequent grumbles from theologians about the alleged lack of theological reading from new atheists, scholars like Dawkins and Dennett are quite familiar with the works of theologians such as Arthur Peacocke and John Polkinghorne (whose primary formation was incidentally scientific)[330]. Additionally, we have found too few arguments detailing why scientists should remain open to theology – why theologians should attentively follow scientific developments and why science does not answer every question and lets a place for theology in the explanatory space, yes; but why scientists could actually benefit from a dialogue with theologians, no. The most pragmatic concerns we have found are

[327] M. RUSE already pointed adaptation out in *The Argument from Design*, p. 29.
[328] D. DENNETT, *Darwin's Dangerous Idea*, p. 66.
[329] L. CHAPP, *Review of* Is Nature Enough?, p. 643.
[330] This is also G. PETERSON'S opinion (see *Why the New Atheism Shouldn't Be (Completely) Dismissed*). A radical answer to this grievance is similar to the courtier's reply – as the child's illiteracy regarding clothing does not allow him to call the Emperor nude, so Dawkins' feeble theological formation should forbid any comment of his on theology (P.Z. MYERS, *The Courtier's Reply*).

restricted to encouraging scientists to feel awed faced with the beauty and immensity of the world and remain humble about the scientific enterprise; neither attitude is typically Christian, and their everyday influence is scant[331]. Theology might need science in order to accurately describe mankind, nature and their relationships to one another and to God, but the converse relation is not true. Utterly polished arguments are required to convince materialist scientists to drop their polite vision of religion as unnecessary or their more radical rejection thereof.

On a higher level, we are left wondering whether preaching for theology's sole possession of the ultimate explanations is truly encouraging dialogue. On one hand, theology's pretension to be the only domain fitted to answer existential questions appears too close to Christian apologetics to grant science the respect it deserves as dialoguing partner[332]. Disregarding materialism and failing to take into account the innate practicality of science would be only evidential signs of this kind of attitude. To illustrate our point, we could give as example of a similar stance Rahner's controversial idea of 'anonymous Christians' and its subsequent interreligious posture: it seems as if whatever 'good' science could bring would be claimed by theologians as theirs, whereas notions opposed to Christian theology would be rejected for their materialistic premises.

On the other hand, separating scientific and theological levels of reading appears highly similar to Gould's proposition of non overlapping magisteria (NOMA), which stated that 'each domain frames its own rules and admissible questions and sets its own criteria for judgment and resolution. Science covers the empirical realm and religion the realm of ultimate meaning and moral value, and there should not be any overlap of these magisteria'[333]. Regardless of NOMA's practical tenability, it has been theoretically rejected by most actors in the science/religion debate: both domains have points of convergence[334]. In parallel to NOMA and its conception of dialogue as a discussion between scholars of completely unrelated fields, evolutionary theology scarcely advocates a fruitful dialogue. We find indicative the placement of process theology (and assuredly Haught had he been named) in the 'convergence' propositions rather than in the 'dynamic complementarity' category in Gisel's reference opus *Encyclopedia of Protestantism*: the former is described as 'concordist',

[331] O. BARCLAY, *Design in Nature*, p. 60.
[332] This warning is also heeded by Paul RICOEUR (*L'homme de science et l'homme de foi*, p. 83).
[333] M. STENMARK, *Contemporary Darwinism and Religion*, p. 187.
[334] See e.g. Ch. SCHÖNBORN, *Création et évolution*, p. 106-107. This paragraph has been omitted in *Reasonable Science, Reasonable Faith*.

while the latter is portrayed as 'the most respectful category for both parties'[335]. We are aware that unadulterated separation is an extreme to which any posture insisting on distinguishing science and theology is at risk of falling prey; we nevertheless feel compelled to remark that the line between distinction and separation is a thin one.

We would like to conclude by noting that the debate about chance and purpose is unlikely to fade away in the upcoming years, not for scientific reasons but for the metaphysical implications of a life driven by chance, even in a small proportion. We believe the strong reaction encountered by evolutionary theory in religious milieus to be related to the deeply rooted fear of anarchy and chaos linked to the atheistic perspective associated with evolutionism; the subsidiary realizations of one's unimportance and of finding oneself entirely responsible of one's actions in the absence of God may also play a significant role – hence the frequent accusations hurled at atheists of arrogance, amorality and nihilism, although these are not strict consequences of being an evolutionist. Creationists and ID theorists do not object to chance *per se* as they do to science, which they perceive as the embodiment of all societal evils; scientific materialists do not insist on chance *per se* but on one of the most convincing arguments they have found to destroy religion, which they see as the root of all evils; theistic evolutions do not hold the compatibility of chance and faith for chance *per se* but for religion's sake, which they understand as lost if it doesn't take into account the current social mindset. Chance in evolution is not the issue; here science merely represents one of the ways that society uses to push religion to change, and it is its ability to adapt, both itself and its message, that is at stake – that, at least, every protagonist agrees upon. In that perspective, elucidating the comprehensions of chance, purpose, design and providence in evolution and in theology is of the utmost importance in order to establish and maintain a proper and fruitful dialogue between science and religion; theistic evolution is nowadays one of the best suited perspectives to achieve such a difficult task. For the sake of our democracies, of science and of peace, we can only hope for success.

[335] Cl. KARAKASH, *Science et foi*, p. 1164-1167, personal translation. Named theologians in the latter include Wolfgang Pannenberg and Gerard Ebeling.

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