Is God an Information Inputter? Complex Specified Information as Evidence for Divine Action

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ABSTRACT

In the 21st century discussion between science and religion, one of the most peculiar phenomena is the theory of intelligent design. According to the theory, some features of the universe are too complex and too well-ordered to have been brought about solely by natural causes. Instead, these features are taken as evidence of the work of an intentional supernatural agent, who is usually identified as the Christian God.

One influential approach to intelligent design is that of William A. Dembski, who sees God as an "information inputter," a being who controls events occurring in the universe by miraculously entering information at convenient times and places. In this article, my aim is to offer an overview of Dembski's theory, as well as to identify and discuss some problems associated with it. Although I do consider the idea of God as an "information inputter" worth exploring and developing further, I suggest that Dembski's notion of complex specified information is not well-defined enough to constitute a reliable method for detecting supernatural design.

INTRODUCTION

In the 21st century discussion between science and religion, one of the most peculiar phenomena is the theory of intelligent design. According to the theory, some features of the universe are too complex and too well-ordered to have been brought about solely by natural causes. Instead, these features are seen as evidence of the work of an intentional supernatural agent.[1] In the context of Christian theology, this agent is usually identified as God, although different versions of the theory of intelligent design could be developed in other philosophical and theological frameworks, even without reference to any particular deity. Theists of different denominations, agnostics, pantheists – and even atheists – could all embrace the theory from their own perspective (Dembski 2000).

Since the 1990s, the Intelligent Design[2] movement has gained wide support in the United

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[1] Discovery Institute, Center for Science and Culture. "Questions about Intelligent Design." Accessed January 29, 2015. http://www.discovery.org/id/faqs/#questionsAboutIntelligentDesign. Definitions of the term "intelligent design" vary. The mentioned definition reflects the self-understanding of the Intelligent Design movement and is, for the purposes of this paper, sufficient.

[2] As a rule, the term "intelligent design" (spelt with lower case letters) is used to refer to the theory that signs of design can be detected in physical phenomena, and the term "Intelligent Design" (spelt with capital letters) to the movement promoting the theory and opposing naturalism, initiated in the United States in the 1990s.

States and has recently risen to public awareness also in Europe. Especially in the United States, the movement has been criticized for having hidden societal purposes and being deeply entangled with conservative politics (Forrest 2001, 5–43; Shanks 2004, xi, 252). In the academic community, intelligent design is often seen only as a modern version of "creationist propaganda" (Dawkins 2009, 128) or "creationism in a cheap tuxedo" (Krishtalka 2003), a thinly disguised attempt of bringing the unscientific concept of God into scientific discussion.[3] In the present paper, the political aspects of the theory of intelligent design are not addressed; instead, the focus is on the content of the actual design argument.

One interesting approach to intelligent design is that of William A. Dembski. Dembski is an American mathematician, theologian and philosopher and one of the leading advocates of the theory of intelligent design. Dembski holds that God controls events occurring in the universe by miraculously entering information at convenient times and places. Furthermore, Dembski asserts that it is possible to empirically detect where God has acted. By using the so-called criterion of specified complexity, Dembski claims to be able to differentiate between objects – or events[4] – that are designed and objects that are caused by natural causes. In Dembski's theory, if an object manifests "complex specified information," it can be inferred as designed.

In this article, I offer a brief overview of Dembski's theory of intelligent design, as well as identify some problems associated with the theory. Although I do consider the idea of God as an "information inputter" well worth exploring and developing further, I argue that Dembski's notion of complex specified information does not constitute a reliable empirical method for detecting supernatural design.

GOD AS INFORMATION INPUTTER

Dembski's theory of God as an information inputter is based on his general philosophical and metaphysical framework. Dembski (2014) describes his metaphysics as "metaphysics of information:" according to him, the fundamental substance of reality is information, not matter, unlike usually considered. Dembski (2014, 96) claims – rather polemically – that materialism is

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[3] For detailed critique, see Baird & Rosenbaum 2007; Forrest & Gross 2005; Perakh 2003; Young & Edis 2004.

[4] Dembski seems to use the terms "object" and "event" interchangeably. What defines an object or an event, is, of course, a question of its own (and one which is beyond the scope of this paper).

nothing more than a myth, a useful narrative that has helped us explain the world in the past, especially since the rise of modern science in the seventeenth century. According to Dembski (2014, 96), however, "like the ancient myths of the old, the 'matter myth' is outliving its usefulness" and must be replaced with a more correct understanding of the world, an understanding based on information.

Dembski still thinks that "matter" is a useful concept, but we should only talk about matter as a medium for information, or as an embodiment of information, not as anything fundamental in itself. In addition to physical matter, Dembski mentions mathematical matter and spiritual matter, which, too, can serve as a medium of information. Mathematical matter refers to abstract objects such as sequences of bits containing information. Spiritual matter, in turn, is something that lies outside our ordinary space-time continuum but can nonetheless transmit information, some sort of "hidden" information created by God. Thus, according to Dembski, information can take many forms. Moreover, the same information can be embodied several times in different embodiments.

Dembski (2007, 197–198) calls himself an "informational realist." Ontologically, informational realism means that entities are thought to exist insofar as they manifest information and interact via information with other entities. Without information, that is, without differentiation and exclusion of possibilities, there would be no way of distinguishing objects from other objects. As Dembski puts it, "objects express their reality informationally." Informational realism does not require the existence of any kind of a deity (Dembski points out that informational realism is compatible with, for instance, informational monism, which holds that all things that exist are information "all the way down"), but Dembski, being a Christian, sees God as the ultimate source of all information existing in the universe.

Dembski's views of God as an information inputter are similar to those offered by John Polkinghorne (1989; 1991; 1994). According to Polkinghorne, God can influence the world without human observers noticing through an input of "active information" in indeterministic chaotic systems. In chaos theory, certain physical systems (non-linear dynamical systems) can be described by functions that are extremely sensitive to initial conditions, which usually makes the behaviour of these systems impossible to predict.[5] Polkinghorne has proposed that although it is

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[5] For a comprehensive introduction to chaotic systems, see, e.g., Alligood, Sauer & Yorke 1997.

impossible for human observers to perceive any predictability in chaotic systems, God still holds all strings in his hands, entering information here and there (although Polkinghorne does not explain how this information input might work) and this way adjusting the initial conditions appropriately to yield significant large-scale effects.

Instead of the chaos theory, Dembski (2009, 117–118) finds the thought that the world of quantum physics would somehow be able to accommodate the actions of God more appealing. Here, Dembski comes close to the so-called quantum divine action theory advocated by Robert Russell (2001) and Nancey Murphy (2009), among others[6] – although Dembski is the only one mentioning information explicitly. The quantum divine action approach is based on the Copenhagen interpretation of quantum mechanics, which asserts that the state of a physical system cannot be predicted in advance by humans, as there exist numerous possible physical states of which only one, an arbitrary one, eventually actualises. God, however, might be able to steer the course of history through deciding in a hidden way which one of the possible states gets actualised. Dembski's idea seems to be that God enters tiny bits of information in a multitude of seemingly insignificant and indeterministic quantum events and this way brings about the desired effects on a wider scale.

Both of the mentioned approaches entail problems. Nicholas Saunders (2000; 2002), for example, has questioned both chaotic systems and quantum events of their ability to actually produce the alleged large-scale effects. According to Saunders, in the real world, phenomena are not as chaotic as they are thought to be in mathematical models. Chaos is merely "a minor background phenomenon and in no way implies whole-scale disorder" (Saunders 2002, 206). In the case of quantum theory, the situation is even more problematic. Saunders (2002, 172) notes that "on the terms of our current understanding of quantum theory, (…) quantum SDA [special divine action] is not theoretically possible." So, in practice – to cite philosopher Jeffrey Koperski (2000, 557) – it appears that "God can alter the arrangement of bubbles in the crest of a tsunami but not redirect its course." Therefore, randomness and indeterminacy present in chaos theory and quantum physics just do not seem to be enough to accommodate the actions of God.

Dembski (2009, 121) is aware of the difficulties mentioned by Saunders. In fact, he even

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[6] See, e.g., Tracy 1995; Ward 1990.

admits that, as far as physics is concerned, we cannot know with certainty the exact mechanism through which God acts in the world. Nevertheless, Dembski is certain that if God wishes, he can move elementary particles according to his will, since "the one who created particles can certainly move them" – and, in Dembski's view, God can even act without moving any particles. Regardless of the actual method of God's acting in the world, what God does when he acts is that he always inputs information,[7] and when information is inputted by God, it usually takes a special form. Dembski calls information created by God "complex specified information."

This is exactly what is special about Dembski's theory. He claims to be able to reliably determine where God has acted, which objects he has decided to bring about through input of information. According to Dembski (1998; 2007), supernatural design can be detected using the criterion of specified complexity.[8] He argues that, using this criterion, design can be detected in any kind of phenomena, no matter how abstract they might be, but stresses that those observed in the biological world are of particular interest. Dembski holds that there are some biological organisms that cannot have been brought about by natural causes. These entities are allegedly too complex and rich in information to have emerged through the "blind" processes of nature, and can only have been produced by a supernatural intelligent designer, God.

COMPLEX SPECIFIED INFORMATION

In Dembski's theory, an event is designed if it expresses complex specified information. In other words, in order to qualify as designed, an event needs to be, firstly, complex and, secondly, specified (Dembski 1998, 36–55). According to Dembski (2007, 155–157), information is complex if the amount of information is higher than 500 bits. The information measure that Dembski uses is $\mathbf{I(P)} = -\log_2 \mathbf{P}$, where $\mathbf{I}$ is the amount of information and $\mathbf{P}$ the probability of an event occurring (the definition is similar to the so-called Shannon information used in information theory)[9]. Put differently, if the probability of an event occurring is lower than 10^{-150}, the event

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[7] Dembski does not explain why God would need to act precisely through input of information.

[8] The term "specified complexity" was first used by chemist Leslie Orgel (1973, 189) to describe the difference between living organisms and non-living matter: "Living organisms are distinguished by their specified complexity. Crystals such as granite fail to qualify as living because they lack complexity; mixtures of random polymers fail to qualify because they lack specificity."

[9] The way Dembski uses his concept of information, however, is different from Shannon's original purpose, which describes the average information transmitted from an information source through a communication channel. For further information, see Shannon 1948; Dembski 2007, Ch. 3.

would be designed, as $500 \approx -\log_2 10^{-150}$. Dembski calls the number 10^{-150} the "universal probability bound" and, correspondingly, 500 bits of information the "universal complexity bound."

The universal probability bound proposed by Dembski (2004, 84–86) is based on three things: 1) the number of elementary particles in the (observable)[10] universe: 10^{80} particles, 2) the maximum rate at which transitions in physical states can occur: 10^{45} transitions per second (inverse of Planck time)[11], 3) the age of the universe: 10^{25} seconds.[12] Dembski deduces that because every specified event requires at least one elementary particle to specify it, and because such specifications cannot be generated faster than Planck time, the number of specified events through the history of the universe must fall below 10^{150}. Thus, every specified event whose probability is less than the universal probability bound is highly improbable. Consequently, every specified event that holds more than 500 bits of information is complex.[13]

A specified event, for Dembski (1998, 14–15, 136–137), is an event that conforms to a pattern that can be determined without reference to the actual event. A pattern representing a specified event is, in turn, called a specification. For example, the faces of Washington, Jefferson, Roosevelt and Lincoln are specifications with respect to certain rock formations on Mt. Rushmore. Specifications do not have to be defined in advance, as long as the pattern can be constructed without knowledge of the event. To sum up: if an event is both complex and specified, it expresses complex specified information and is – in the sense of Dembski's theory – designed.

But even if we could reliably discover that there exists some biological objects that exhibits specified complexity (as defined by Dembski), why should we think that these objects are designed? Is it not possible that complex specified information has emerged without any designer,

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[10] According to Dembski (2007, 84–85), there is "no empirical difference" between the entire universe and the observable universe. To a large extent, I agree and think that in science, only hypotheses that can be confirmed or rejected through observations should be considered valid

[11] Planck time (5.3912×10^{-44} seconds) is the shortest unit of time that can be observed in physics. It is defined as the time that is required of a photon travelling at the speed of light to travel a distance of a Planck length (the shortest possible observable length) in a vacuum (Rosen 2004, 254).

[12] Actually, the universe is understood to be billion times younger than this (Liddle & Loveday 2008, 12–13). Dembski is rather conservative in his estimations.

[13] For a more "dynamic" version of the universal probability bound (which, however, yields the same result), see Dembski 2005, 16–20, 33–34.

merely by natural processes? Why would Dembski refuse to accept the consensus view of contemporary science that the development of all living organisms can be properly described by evolutionary mechanisms such as natural selection and random mutations? According to Dembski (2007, 149–150), there are four possible causes of complex specified information: 1) necessity, 2) chance, 3) combination of necessity and chance, and 4) design. Dembski calls the first three "natural causes" and aims to show that none of these is capable of producing complex specified information. Therefore, since the four causes are exhaustive, Dembski deduces that complex specified information is always brought about by a designer.

Necessity, Dembski (2007, 151–155) explains, is characterised by deterministic functions that can never add to information but only preserve or degrade it. If an output of a function constitutes complex specified information, then complex specified information is necessarily already present in the input of the function, and the question about the origin of the complex specified information remains unanswered. Here, Dembski is obviously right. Consider a deterministic function f with input i and output o, viz. $f(i) = o$, and let $\mathbf{P}(i)$, $\mathbf{P}(o)$ the probabilities attached to objects i and o. Since by definition, for all a and b, $\mathbf{P}(a \text{ and } b) = \mathbf{P}(a) \times \mathbf{P}(b \mid a)$, where $\mathbf{P}(b \mid a)$ is the probability of b under the assumption that a obtains, we get $\mathbf{I}(a \text{ and } b) = -\log_2 \mathbf{P}(a \text{ and } b) = -\log_2 [\mathbf{P}(a) \times \mathbf{P}(b \mid a)] = -\log_2 \mathbf{P}(a) - \log_2 \mathbf{P}(b \mid a) = \mathbf{I}(a) + \mathbf{I}(b \mid a)$, where $\mathbf{I}(b \mid a)$ is now the new information available in b when the information in a is already known. With respect to function f, the input i completely determines the output o, so $\mathbf{I}(o \mid i) = 0$ and, consequently, $\mathbf{I}(i \text{ and } o) = \mathbf{I}(i)$.

Chance, for its part, is able to generate complex information. No deterministic restrictions for chance processes exist (of course, there are always some conditions that restrict real-life phenomena), so we have no way of predicting what sort of information a specific chance process will produce. According to Dembski (2007, 155–157), however, information produced by chance is always unspecified, never specified. Dembski argument is rather straightforward: he relies on his universal complexity bound (discussed above) and seems to take it for granted that events with more than 500 bits of information (events whose probability is less than 10^{-150}) simply are too improbable to come about by chance. To support his view, Dembski (2007, 157) even quotes Richard Dawkins (1986, 139), who has asserted that "we can accept a certain amount of luck in our explanations, but not too much." The role of chance in producing information is not especially

controversial: both proponents and opponents of the theory of intelligent design agree that chance alone is not enough to generate complex specified information.

What, instead, is controversial, is the potentiality of the combination of necessity and chance to produce complex specified information. In biology, where much of Dembski's attention is directed to, the overwhelming consensus among scientists is that the evolutionary mechanism of natural selection and random mutations, which corresponds to the interplay between necessity and chance, is all that is needed to produce every lifeform ever existed (IAP 2006). Dembski (2007, 157–159), however, begs to differ. He maintains that necessity and chance together are no more capable of bringing about objects manifesting complex specified information than necessity and chance alone. Dembski justifies his claim as follows: The interplay between necessity is chance can be described by a non-deterministic function (a stochastic process) $f(i, \omega) = o$, where i is the input of the function, ω a chance variable and o the output of the function. According to Dembski, the stochastic process can be divided into two parts, a random one and a deterministic one. In the first stage, a chance outcome ω occurs and produces information – but never specified information since only chance is involved. Neither in the second stage, where we now have a deterministic function $f(i, \omega)$ with a fixed parameter ω, can specified information be generated, for the same reasons as in the case of mere necessity.[14]

Dembski (2007, 158–159) is positive that his model correctly describes the way that chance and necessity operate in the world, be it individually or together. He states that the argument "holds for Darwin's mutation-selection mechanism, for genetic algorithms, and indeed for any other chance-law combination." After eliminating all combinations of chance and necessity, the existence of complex specified information can only be attributed to design.

CREDIBILITY OF THE CRITERION OF COMPLEX SPECIFIED INFORMATION
Next, I want to point out some problems regarding Dembski's theory. Dembski's ideas have already attracted a considerable amount of critique in the literature. The critics are concerned with, for instance, the modes of explanation of events (Van Till 1999, 668–670; Fitelson, Stephens & Sober 1999, 486), the ability of the criterion of specified complexity to classify events correctly (Murray 2012, 602–603), the circularity of Dembski's reasoning regarding specifications

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[14] For a more comprehensive discussion, see Dembski 2007, 127–129, 151–155.

(Bartholomew 2008, 97–115; Murray 2012, 600), and the difficulty of defining specifications independent from probabilities (Perakh 2004, 45–53). In this paper, I focus on the concept of complex specified information and the alleged inability of natural causes to produce complex specified information, with special attention to complex specified information in biology.

To start with, the cornerstone of Dembski's theory, "universal complexity bound," which is defined as 500 bits of information, seems rather dubious. As presented above, Dembski's definition is based on the maximum possible number of interactions of elementary particles allowed by the natural laws. On the other hand, we also saw that Dembski is certain that God can move particles according to his will without minding the natural laws ("the one who created particles can certainly move them"). The contradiction is evident. If God is omnipotent, we cannot know how many specified events he has decided to bring about, and, in consequence, defining the universal probability bound is impossible (Tellgren 2002, 10–11, n. 4). Also, the claim that the probability of the occurrence of an event could be determined by the number of possible specified events is questionable. This is because the probability of an individual event depends only on the phenomenon under examination, not on some theoretical number of possible events (Fitelson, Stephens and Sober 1999, 485–486). Probability distributions vary from phenomenon to phenomenon, so no universal probability bound can be set.

Another one of Dembski's central concepts, "specification," which is argued to be an objectively determinable indicator of design, actually appears to be subjective. As in Dembski's theory, any pattern that can be defined independently of the event suffices as a specification, and the same event can be interpreted as both designed and non-designed depending on the background information of an individual observer. Dembski (2002, 66) admits this but explains that although specifications are ontologically subjective, they are always epistemically objective.[15] An all-knowing observer with unlimited background information can always classify a pattern correctly as specified or non-specified. However, I fail to see how human observers with necessarily imperfect background information could ever obtain this objectivity. Therefore, defining

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[15] Dembski invokes here the distinction between ontological subjectivity and objectivity and epistemic subjectivity and objectivity drawn by John R. Searle (1995, 5–13). Ontologically subjective things only exist when they are perceived, whereas epistemically objectives things exist if they exists regardless whether an individual person believes in their existence.

specifications always remains subjective (at least to some extent).[16]

Leaving aside the problems attached to the concept of complex specified information itself – and accepting, if merely for the sake of argument, that complex specified information is a well-defined concept – let us next focus on the possibility that complex specified information could be produced by natural causes. Dembski holds that the combination of necessity and chance is unable to generate complex specified information for the simple reason that neither part of the two-stage process, neither the random part nor the deterministic part, is able to produce complex specified information. But are things really so straightforward? I would be inclined to think that they are not, based on a comment that Dembski himself makes. Namely, Dembski (2007, 154) notes that a function can, in fact, add information "because the information is embedded in the function itself." In other words, when the information in the function f is taken into account, the amount of information present in the output o may well exceed the amount of information present in the input $i = f(o)$.

Nevertheless, Dembski (2007, 154–155) holds that this does not really change the situation. He employs a "universal composition function" U, which combines the information from the input i and the function f. Now, $U(i, f) = f(i) = o$, so the combined information content of i and f is at least as large as the information content of o. On one hand, this is true, and there is nothing wrong in formulating such a composition function; but on the other hand, the function U is not the function we are really interested in, and introducing U does not cancel out the ability of the original function f to generate information and to be treated as a separate entity of information. Consider now the two- stage process of the combination of necessity and chance (as described by Dembski), and assume that, in the first stage, a chance event ω generates complex non-specified information (as allowed by Dembski's theory). In the second stage, where the deterministic function $f(i, \omega)$ is applied to the event ω, the information can, firstly, remain complex. Secondly, now that we can treat the input i and the function f as separate objects of information, even though the information in i and f is not specified, the information in o can become specified when the information in i and f are combined. For example, if i is an encoded message and f an unknown decryption function,

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[16] For a fuller discussion on the universal probability bound and defining specifications, see my forthcoming article "William A. Dembski's Argument for Detecting Design through Specified Complexity."

the decrypted message o clearly is specified although neither i nor f can be recognised as specified (Shallit 2002, 94).[17] Therefore, it must be concluded that natural causes are actually able to produce information even within the framework introduced by Dembski.

COMPLEX SPECIFIED INFORMATION AND BIOLOGY

One of Dembski's main targets of criticism – alongside materialistic philosophy – is the theory of evolution. Still, Dembski (2004, 323–327) accepts the basic principles of the theory and even admits that "intelligent design is perfectly compatible with common descent" – a claim that many intelligent design proponents would probably not agree with. Nevertheless, Dembski believes that there exist some biological organisms that, although having been developed through the evolutionary mechanism, are so complex that they cannot have done this without an interference of an intelligent agent, or, to be more precise, without input of information by an intelligent agent. Somewhere in the development process of these organisms, an "information boost," which has then been accommodated by the evolutionary mechanism, has had to happen.

Dembski (2007, 290–302) defines the probability of a "discrete combinatorial object"– which appears to refer to any biological organism – with the formula $\mathbf{p}_{dco} = \mathbf{p}_{orig} \times \mathbf{p}_{local} \times \mathbf{p}_{config}$, where $\mathbf{p}_{orig}$ is the probability of originating the building blocks for the object, $\mathbf{p}_{local}$ the probability of locating the building blocks in one place once they are given, and $\mathbf{p}_{config}$ the probability of configuring the building blocks once they are given and in one place. Dembski admits that the origination probability $\mathbf{p}_{orig}$ of basic building blocks of life such as amino acids cannot be very small or else life would not be possible in the first place. For simplicity, we can even assume that $\mathbf{p}_{orig} = 1$ and examine just the probabilities $\mathbf{p}_{local}$ and $\mathbf{p}_{config}$.

The only biological organism that Dembski has actually attempted to prove as designed is the flagellum of *Escherichia coli* bacterium. Of course, if Dembski is correct, that is, if the flagellum exhibits complex specified information (and if the criterion of specified complexity really is a reliable method of detecting design), one counterexample is sufficient to disprove the claim that all biological organisms have been produced by natural causes. Dembski (2007, 292–302) calculates the localisation probability of the bacterium to be $\mathbf{p}_{local} = (500/4289)^{250} \approx 4.5 \times 10^-$

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[17] Dembski would probably point out that both i and f are, ontologically speaking, specified. An observer with unlimited background information would be able to formulate the relevant patterns. However, a human observer would most likely fail to infer i and f as specified.

[234],[18] and estimates the value of the configuration probability (indirectly, by using the so-called perturbation probabilities)[19] to be $\mathbf{p}_{config} \approx 10^{-234}$. Both of these values clearly fall below the universal probability bound, so the flagellum must constitute complex specified information.

There is his nothing wrong with Dembski's calculations as such. The complete genome sequence of *Escherichia coli* has been determined (Blattner et al. 1997), and the number of proteins coded by the DNA of the bacterium, as well as the number of proteins needed to build the flagellum, is well known. The problem is that, for some reason, Dembski only calculates the probability of the existence of the bacterial flagellum on the condition that the flagellum was formed by chance, through a random assembly of amino acids and proteins. Random assembly of individual parts, however, is not what the theory of evolution is about; instead, it is all about gradual development of parts that evolve together and form complex structures. So when Dembski claims to have shown that the flagellum is extremely improbable to have been developed through evolutionary mechanisms, he has, in fact, shown that the proteins needed to form the flagellum are extremely improbable to have been randomly drawn together and arranged conveniently to constitute the flagellum. Dembski has not proven the theory of evolution to be wrong but only "the theory of random assembly" (which, as far as I know, nobody has ever suggested).[20]

Even if we chose to accept Dembski's view that the bacterial flagellum is complex (in the sense of the theory of intelligent design), in order for the flagellum to count as designed, it must also be specified. Dembski (2004, 111) maintains that the flagellum is, in fact, specified because "humans have developed motor-driven propellers well before they figured out that the flagellum was such a machine." In other words, the specification (a motor-driven propeller) would exist independently of the event (the flagellum). There is, however, a vast difference between any

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[18] Localisation probability is based on the following assumptions: 1) the DNA of the bacterium codes 4289 proteins, of which 50 is needed to form the flagellum; 2) for a functional flagellum, five copies of each of the 50 proteins are required; 3) for each of the 50 proteins, there exists ten interchangeable alternate proteins. Assumptions 2 and 3 are Dembski's own estimates, which, according to him, are "extremely conservative." (Dembski 2007, 293.)

[19] Perturbation probability is calculated as follows: $\mathbf{p}_{perturb} \approx [C(N,qN)/(N,rN)](k-1)^{qN-rN}$, where $C(a,b) = a!b!(a-b)!$, N is the number of subunits of an object, k the number of different types of subunits, q a perturbation tolerance factor ($0 \leq q \leq 1$), r a perturbance identity factor ($0 \leq r \leq 1$). (Dembski 2007, 299.)

[20] Furthermore, instead of calculating the probability of the flagellum, it might be more appropriate to calculate the probability of any such combination of proteins that would produce a structure enabling a single-celled organism to move efficiently.

motor-driven propeller and the flagellum of *Escherichia coli*. Certainly, to some extent, the flagellum resembles a propeller, but any closer inspection necessarily reveals various differences. This supports my previous assertion that defining specifications is always subjective. Dembski (2004, 111) also adds that "no biologist I know questions whether the functional systems that arise in biology are specified." This might well be true, but, on the other hand, I am relatively sure that no biologist even uses the term "specified," at least not in the way it is used in Dembski's theory. On the whole, it is highly questionable whether the flagellum – or any other biological object – can be taken to be specified.

Judging from the previous quotation, Dembski seems to think that every "functional system" in biology (an expression that comprises an enormously wide variety of biological systems) is specified. Yet, he only focuses on one of them, on the flagellum of *Escherichia coli*. Why does he not give more examples? After all, many biological systems clearly are more "complex" than the bacterial flagellum. To speculate, Dembski's approach might have to do with the fact that the causal (evolutionary) history of many other organisms is already well known, and, in these cases, it would be not very convincing to offer a competing explanation, that of information input by a supernatural designer. Still, if Dembski followed his own logic consistently, he should argue that all biological organisms that are complex and specified are designed – even those whose causal history has already been figured out by biologists. Since Dembski does not do this, one might wonder whether he really believes his theory to be as all-encompassing is it claimed to be.

In the case of the flagellum of *Escherichia coli*, although the bacterium has been widely examined, Dembski is convinced that no clear account of its causal history is known.[21] He argues this to imply that no evolutionary pathway exists. In other words, the inability of biologists to come up with a detailed explanation for the existence of the flagellum is seen as equivalent to the inability of natural causes to account for the existence of the flagellum. Dembski goes on to deduce that because natural causes cannot explain the development of the flagellum, the only remaining option, *i.e.*, that the flagellum is designed, has to be true. Of course, there is a logical possibility

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[21] Some biologists have pointed out, *contra* Dembski, that the evolutionary history of the flagellum can actually be constructed, or at least speculated about (see, *e.g.*, Macnab 1999; Pallen & Matzke 2006; Wong et al. 2007).

(unless one is strictly committed to metaphysical materialism) that the flagellum is designed, and, certainly, in that case, the consequences to science would be revolutionary. Darwin (1859, 189) himself admitted that "if it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down."[22] There is, however, no direct evidence pointing to design. There is only a (possible) gap in knowledge of the development of the flagellum that we may choose to fill with the predictions of either the theory of intelligent design or the theory of evolution.

In my opinion, the latter option is much more credible. The theory of evolution has proved its predictive power and has enabled scientists to make continuous discoveries during the last century. The theory of intelligent design, in turn, is yet to provide an alternative positive research programme (Boudry, Blancke & Braeckman 2010). We cannot predict in advance what some specific biological features would look like if they were designed, because we have no way of knowing the intentions of the supernatural designer. This is, generally speaking, perhaps the biggest problem of the theory of intelligent design. Design simply cannot be predicted.

CONCLUSION

To conclude, the deficiencies mentioned in the previous chapters cast serious doubts on Dembski's theory based on the notion of specified complex information. In order for the theory of intelligent design to have any chance of becoming a reliable method for detecting supernatural design, at least the following aspects of the theory need to be reconsidered: 1) the definition of the concept of specified complexity, 2) the ability of the combination of necessity and chance to generate complex specified information, 3) the ability of evolutionary processes to generate complex specified information in the biological world. Nevertheless, I do think that Dembski's approach based on information could become one of the more fruitful aspects of the theory of intelligent design. If we consider Dembski's basic claim that any complete explanation regarding the world should take into account possible supernatural agents who interact with the world – be it through information input or some other way – this is a logically plausible hypothesis and should not be excluded from discussion *a priori*. The problem is, in my opinion, that Dembski goes a bit too far with his ideas.

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[22] It must be emphasized that Darwin continues by stating that he "can find out no such case." For Darwin, the existence of an organism that would not have been developed through slight, successive modifications, was impossible.

After all, he is saying that he can reliably detect divine action with his criterion of specified complexity. In practice, this means that he could reliably prove the existence of a supernatural designer, or God (of some kind). Perhaps, if Dembski developed his ideas less ambitiously, I believe his theory could find more credibility and contribute more fruitfully to the discussion between science and religion.

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