An Information-Theoretic Design Argument

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1. Historical Synopsis

The design argument begins with features of the natural world that exhibit evidence of purpose and from there attempts to establish the existence and attributes of an intelligent cause responsible for those features. Just what features signal an intelligent cause, what the nature of that intelligent cause is (for example, personal agent or teleological process), and how convincingly those features establish the existence of an intelligent cause remain subjects for debate and account for the variety of design arguments over the centuries. In this paper I formulate the design argument in terms of information theory. To set the stage, I want first to provide a brief historical overview of design arguments.

Perhaps the best known design argument is William Paley's. According to Paley, if we find a watch in a field, the watch's adaptation of parts to telling time ensures that it is the product of an intelligence. So too, according to Paley, the marvelous adaptations of means to ends in organisms (like the human eye) ensure that organisms are the product of an intelligence. Paley published this design argument in 1802 in a book titled *Natural Theology*. The subtitle of that book is revealing: *Evidences of the Existence and Attributes of the Deity, Collected from the Appearances of Nature*. Paley's project was to examine features of the natural world ("appearances of nature") and from there draw conclusions about the existence and attributes of a designing intelligence responsible for those features (whom Paley identified with the God of Christianity).

Paley was too optimistic about how much theological mileage could be obtained from the design argument. As Immanuel Kant noted in his *Critique of Pure Reason*, the most the design argument can establish is "an architect of the world who is constrained by the adaptability of the material in which he works, not a *creator* of the world to whose idea everything is subject." Far from rejecting the design argument, Kant objected to overextending it. For Kant, the design argument legitimately establishes an "architect" (that is, an intelligent cause whose contrivances are constrained by the materials that make up the world), but it can never establish a creator who originates the very materials which the architect then fashions.

We need here to draw a clear distinction between creation and design. Creation is always about the source of being of the world. Design is about arrangements of preexisting materials that point to an intelligence. Creation and design are therefore quite different. One can have creation without design and design without creation. For instance, one can have a doctrine of creation in which God creates the world in such a way that nothing about the world points to design. Richard Dawkins has a book titled *The Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe without Design*. Suppose Dawkins is right about the universe revealing no evidence of design. It would not logically follow that it was not created. It is logically possible that God created a world that provides no evidence of his handiwork. On the other hand, it is logically possible that the world is full of signs of intelligence but was not created. This was the ancient Stoic view, in which the world was eternal and uncreated, and yet a rational principle pervaded the world and produced marks of intelligence in it.

There's a joke that clarifies the difference between design and creation. Scientists come to God and claim they can do everything God can do. "Like what?" asks God. "Like creating human beings," say the scientists. "Show me," says God. The scientists say, "Well, we start with some dust and then—." God interrupts, "Wait a second. Get your own dust." Just as a carpenter must take preexisting wood to form a piece of furniture, so these scientists have to take preexisting dust to form a human being. But where did the dust—the raw materials—come from to make a human being? From stars? And where did stars come from? From the Big Bang? And where did the Big Bang come from? From a quantum vacuum fluctuation? And where did that quantum fluctuation come from? At some point such questions must end. Creation asks for an ultimate resting place of explanation—the source of being of the world. Design, by contrast, inquires not into the ultimate source of matter and energy but into the cause of their present arrangements, particularly those entities, large and small, that exhibit signs of intelligence.

Even Thomas Aquinas admitted the need for modesty in design reasoning. In his *Summa Contra Gentiles*, Aquinas wrote: "By his natural reason man is able to arrive at some knowledge of God. For seeing that natural things run their course according to a fixed order, and since there cannot be order without a cause of order, men, for the most part, perceive that there is one who orders the things that we see. But who or of what kind this cause of order may be, or whether there be but one, cannot be gathered from this general consideration." Aquinas here was not doing first philosophy or metaphysics. He was simply noting that our natural reason readily infers some sort of "orderer" or "designer" behind nature. Aquinas calls this designer God, but he was clearly speaking of this designer very loosely—the nature and even plurality of that designer could for Aquinas not be settled simply by studying nature.

Design arguments can tell us that certain patterns exhibited in nature reliably point us to a designing intelligence. But there's no inferential chain that leads from such finite design-conducing patterns in nature to the infinite personal transcendent creator God of Christianity. Nevertheless, a design argument can clear away materialistic stumbling blocks to belief in God (for example, it can refute the claim that science has shown that all the patterns in nature can be explained without recourse to intelligence). Clearing away such stumbling blocks has immense apologetic value, especially in the current cultural and intellectual climate. A particularly effective way to cash out the design argument is with the concept of information. Such an information-theoretic design argument is the subject of the remainder of this paper.

2. Information and Matter

To develop this argument, let's start by elucidating the distinction between information and matter. Imagine you are an interior decorator. Bill Gates hires you to decorate his mansion. You decide to put a big marble bust of the composer Ludwig van Beethoven in the music room. You therefore contract with Laszlo, a promising if eccentric young sculptor, to make the bust and deliver it to the mansion. The next day he drops by the mansion and tells you he's finished. Naturally you're skeptical, but he rolls an imposing crate into the music room and with some fanfare removes the "sculpture." You find yourself staring at a big marble cube. Shocked, you ask the sculptor where the bust of Beethoven is. "The bust is there all right," he says, handing you his bill. "You just have to scoot aside the excess marble." When you protest, he grows red faced and yells, "I defy you to find a single, solitary molecule of Beethoven's bust that isn't in that block of marble! Now pay what you owe me!"

The quarrel escalates, each of you growing increasingly red-faced until who should walk into the room but Bill Gates himself. He calms the two of you and gets first your side of the story and then the sculptor's. "Tell you what," Gates says after he's heard the sculptor out. "I'm so impressed with your sculpture, Laszlo, that instead of paying you what we agreed I'll trade you an advance copy of the next generation of Microsoft Windows." Here Gates produces an unmarked compact disc. "This is it, and you're free to sell the operating system on the black market to whomever you wish as often as you wish." "Are you crazy?" you shout, forgetting yourself. "That's worth billions!" "Deal!" Laszlo shouts, snatches the disc from Gates's hand, and rushes to a nearby computer. After some pointing and clicking, the sculptor turns on Mr. Gates. "The disc is blank! Give me the operating system!" "Oh but friend," Gates says, resting an avuncular hand on the young sculptor's shoulder. "I defy you to find a single, solitary molecule of the operating system that isn't on that disc. You just have to scoot aside the excess polycarbonate and there it is."

This story illustrates the difference between information and matter. Matter is raw stuff that can take any number of shapes. Information is what gives shape to matter, fixing one shape to the exclusion of others. Both the words matter and information derive from Latin. Matter (from the Latin noun *materia*) initially referred to the raw timber used in building houses. Later it came to mean any raw stuff or material with the potential to assume different shapes, forms, or arrangements. Information (from the Latin verb *informare*) literally means to give form or shape to something. Unlike passive or inert matter, which needs to be acted upon, information is active. Information acts on matter to give it its form, shape, arrangement, or structure. (Note that I'm using these terms loosely and interchangeably. Aristotle would distinguish form, in the sense of substantial form or essence, from mere shape or arrangement. It's enough for my purposes here, however, that shape or arrangement be correlated with form in Aristotle's sense. Thus for marble to express the form [*sensu* Aristotle] of Beethoven's likeness, it must be shaped or arranged in very particular ways.)

As an interior decorator, you were paying the sculptor to "inform" a slab of marble—to take an unformed slab of marble and give it the form or shape of Ludwig van

Beethoven. For the sculptor to tell you that the cube of marble contains the promised bust of Beethoven (you just have to remove some excess marble) is therefore totally unacceptable. That's what you were paying the sculptor to do. Yes, the marble cube has the potential to become a bust of Beethoven. But it also has the potential to take on countless other shapes. It was the sculptor's job to give the marble the shape you requested.

The relation between matter, with its potential to assume any possible shapes, and information, with its restriction of possibilities to a narrow range of shapes, is fundamental to our understanding of the world. Certainly, this relation holds for all human artifacts. This is true not only for human artifacts composed of physical stuff (like marble busts of Beethoven), but also for human artifacts composed of more abstract stuff (like poetry and mathematics). Indeed, the raw material for many human inventions consists not of physical stuff but of abstract stuff like alphabetic characters, musical notes, and numbers. For instance, the raw material for a Shakespearean sonnet consists of the twenty-six letters of the alphabet. Just as a bust of Beethoven is only potential in a slab of marble, so a Shakespearean sonnet is only potential in those twenty-six letters. It takes a sculptor to actualize the bust of Beethoven, and it takes a Shakespeare to arrange those twenty-six letters appropriately so that one of his sonnets emerges.

The relation between matter and information that we are describing here is old and was understood by the ancient Greeks, especially the Stoics. What's more, nothing said so far about the relation between matter and information is especially controversial. The world consists of a lot of raw material waiting to be suitably arranged. There's matter, passive or inert stuff waiting to be arranged, and there's information, an active principle or agency that does the arranging. This is a perfectly straightforward and useful way of carving up experience and making sense of the world. Much of our knowledge of the world depends on understanding the relation between matter and information.

Nonetheless, the relation between matter and information does become controversial once we add another dimension to it. That happens when we place matter and information in combination with design and nature:

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           Information
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Nature —————————+————————— Design
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              Matter
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So far the examples of information that we've considered have focused on the activity of a designing intelligence (a sculptor or writer) informing or giving shape to certain raw materials (a slab of marble or letters of the alphabet). But designing intelligences are not the only causal powers capable of structuring matter and thereby conferring information. Nature, too, is capable of structuring matter and conferring information.

Consider the difference between raw pieces of wood and an acorn. Raw pieces of wood do not have the power to assemble themselves into a ship. For raw pieces of wood to form a ship requires a designer to draw up a blueprint and then take the pieces of wood and, in line with the blueprint, fashion them into a ship. But where is the designer that causes an acorn to develop into a full-grown oak tree? There isn't any. The acorn has within itself the power to transform itself into an oak tree.

Nature and design therefore represent two different ways of producing information. Nature produces information, as it were, internally. The acorn assumes the shape it does through powers internal to it—the acorn is a seed programmed to produce an oak tree. On the other hand, a ship assumes the shape it does through powers external to it—a designing intelligence imposes a suitable structure on pieces of wood to form a ship.

Not only did the ancient Greeks know about the distinction between information and matter, but they also knew about the distinction between design and nature. For Aristotle, for instance, design consisted in capacities external to an object for bringing about its form with outside help. On the other hand, nature consisted in capacities internal to an object for transforming itself without outside help. Thus in Book XII of the *Metaphysics* Aristotle wrote, "[Design] is a principle of movement in something other than the thing moved; nature is a principle in the thing itself." In Book II of the *Physics* Aristotle referred to design as completing "what nature cannot bring to a finish." (Note that Thomas Aquinas took this idea and sacramentalized it into grace completing nature).

The Greek word here translated "design" is *techne*, from which we get our word technology. In translations of Aristotle's work, the English word most commonly used to translate *techne* is "art" (in the sense of "artifact"). Design, art, and *techne* are synonyms. The essential idea behind these terms is that information is conferred on an object from outside the object and that the material constituting the object, apart from that outside information, does not have the power to assume the form it does. For instance, raw pieces of wood do not by themselves have the power to form a ship.

This contrasts with nature, which does have the power within itself to express information. Thus in Book II of the *Physics* Aristotle wrote, "If the ship-building art were in the wood, it would produce the same results by nature." In other words, if raw pieces of wood had the capacity to form ships, we would say that ships come about by nature. The Greek word here translated "nature" is *phusis*, from which we get our word physics. The Indo-European root meaning behind *phusis* is growth and development. Nature produces information not by imposing it from outside but by growing or developing informationally rich structures from within. Consider again the acorn. Unlike wood that needs to be fashioned by a designer to form a ship, acorns produce oak trees naturally—the acorn simply needs a suitable environment in which to grow.

The central question that an information-theoretic design argument needs to resolve can therefore be stated as follows: Is nature complete in the sense of possessing all the resources needed to bring about the information-rich structures we see in nature or does nature also require some contribution of design to bring about those structures? Aristotle claimed that the art of ship-building is not in the wood that constitutes the ship. We've seen that the art of sonnet-composing is not in the letters of the alphabet. Likewise, the art of statue-making is not in the stone out of which statues are made. Each of these cases requires a designer. So too, an information-theoretic design argument contends that the art of building certain information-rich structures in nature (like biological organisms) is not in the physical stuff that constitutes these structures but requires a designer.

3. Complex Specified Information

I want next to describe the particular type of information required for an information-theoretic design argument, namely, *complex specified information*. To understand this concept we need briefly to review contemporary information theory as employed by mathematicians (don't worry, I'll keep the discussion user-friendly). Ordinarily when we think of information, we think of meaningful statements that we communicate to each other. The vehicle of communication here is language, and the information is the meaning communicated by some utterance or linguistic expression. This picture of information diverges sharply from the picture of information associated with the mathematical theory of information. The ordinary picture of information focuses on meaning and treats the linguistic vehicle by which that meaning is transmitted as secondary. The mathematical picture of information, by contrast, focuses exclusively on the vehicle and ignores the meaning entirely.

Consider a spy who needs to determine the intentions of an enemy—whether that enemy intends to go to war or preserve the peace. The spy agrees with headquarters about what signal will indicate war and what signal will indicate peace. Let's imagine that the spy will send headquarters a radio transmission and that each transmission takes the form of a bit string (i.e., a sequence of 0s and 1s). The spy and headquarters might therefore agree that 0 means war and 1 means peace. But because noise along the communication channel might flip a 0 to a 1 and vice versa, it might be good to have some redundancy in the transmission. Thus the spy and headquarters might agree that 000 represents war and 111 peace and that anything else will be regarded as a garbled transmission. Or perhaps they will agree to let 0 represent a dot and 1 a dash and let the spy communicate via Morse code in plain English whether the enemy plans to go to war or maintain peace.

This example illustrates how information, in the sense of meaning, can remain constant whereas the vehicle for representing and transmitting this information can vary. In ordinary life we are concerned with meaning. If we are at headquarters, we want to know whether we're going to war or staying at peace. Yet from the vantage of mathematical information theory, the only thing that's important here is the mathematical properties of the linguistic expressions we use to represent the meaning. If we represent war with 000 as opposed to 0, we require three times as many bits to represent war, and so from the vantage of mathematical information theory we are utilizing three times as much information. The information content of 000 is three bits whereas that of 0 is just one bit.

Claude Shannon invented the mathematical theory of information shortly after World War II. The inspiration for his theory derived from his work during the war on cryptography. In cryptography, meaningful messages get encrypted to prevent an enemy from reading one's mail. The important thing in cryptography is to have a secure encryption-decryption scheme, to be able to code messages efficiently as character strings from some alphabet, and then to be able to move those character strings efficiently across communication channels.

The actual meaning of a character string therefore takes second seat in the mathematical theory of information. Think of the mathematical theory of information as an internet service provider. The internet service provider is not concerned with the meaning of your email messages or what product you're trying to sell on your website. What they're concerned about is that the character strings you use to convey meaning in your emails or on your website is faithfully stored and transmitted. That's what the mathematical theory of information is all about. Specifically, it is about quantifying the information in such character strings, characterizing the statistical properties of such strings when they are sent across a noisy communication channel (noise typically is represented as a stochastic process that disrupts the strings in statistically well-defined ways), preserving the strings despite the presence of noise (i.e., the theory of error-correcting codes), compressing the strings to improve efficiency, and transforming the strings into other strings to maintain their security (i.e., cryptography).

Although Shannon's theory started out as a syntactic theory concerned with character strings based on a fixed alphabet, it quickly became a statistical theory. Characters from an alphabet will often have different probabilities of occurrence (for instance, the letters from our ordinary alphabet occur with widely varying frequencies—in English the letter *e* occurs roughly 13 percent of the time, the letter *q* less than 1 percent of the time; what's more, *u* follows *q* with probability one). These probabilities in turn determine how much information any given string can convey. In general, the quantity of information contained in a character string corresponds to the improbability of that character string. Thus, the more improbable the string, the more information it contains.

To see why this should be the case, consider the claim "it's raining outside." This claim will be more informative (now in a loose semantic sense) depending on how improbable it is. If it refers to weather in the Sahara desert during the summer when the chance of rain is very low, then this claim will be both highly improbable and highly informative—it's telling you something you wouldn't otherwise have guessed. But if this claim refers to weather in Seattle during the spring when the chance of rain is very high, then it will be both probable and uninformative—it's telling you something you could easily have guessed. The mathematical theory of information models this feature of our ordinary understanding of information, making high probability claims have low information content and low probability (high improbability) claims have high information content.

Given this characterization of high and low information in terms of probability, there's no reason to confine the mathematical theory of information to character strings. Indeed, any reference class of possibilities over which there is a probability distribution is fair game for the mathematical theory of information. For information to be generated therefore means identifying one possibility and ruling out the rest. The more possibilities get ruled out and, correspondingly, the more improbable the possibility that actually obtains, the greater the information generated. To rule out no possibilities is to assert a tautology and provide no information. "It's raining or it's not raining" is true but totally uninformative. On the other hand, "it's raining" is informative because it rules out "it's not raining." Moreover, "it's raining" is informative to the degree that this claim is improbable (this claim is therefore going to be more informative in the Sahara desert than in Seattle).

To generate information is therefore to rule out possibilities. Moreover, the amount of information generated here corresponds to the probability of that possibility (or range of possibilities) that wasn't ruled out. But who or what rules out possibilities? In practice, there are two sources of information: intelligent agency and physical processes. An intelligent agent may explicitly identify a pattern within the reference class of possibilities and thereby generate information. Alternatively, a physical process can produce an event, represented as a possibility within the reference class of possibilities, and thereby generate information. Let us refer to the former type of information as *agent-induced* or *conceptual information* and to the latter as *event-induced* or *physical information*.

Now, what happens when conceptual information and physical information coincide? Consider, for instance, the Search for Extraterrestrial Intelligence (SETI), which looks for signs of intelligence in radio signals from outer space. What happens if, as a conceptual act, SETI researchers identify a sequence of prime numbers, and then, lo and behold, as in the movie *Contact*, that very sequence is transmitted, as a physical event, to the radio telescopes that these same SETI researchers are monitoring? As in the movie, they would conclude that an extraterrestrial intelligence had established contact. Now it's precisely such a coincidence between conceptual and physical information that constitutes complex specified information.

Yet within Shannon's theory of information, such a coincidence plays no role. Shannon's theory is simply concerned with generating information from a reference class of possibilities. It is immaterial to Shannon's theory whether the information generated is agent-induced or event-induced. Complex specified information, by contrast, requires a dual ruling-out of possibilities, one by an intelligent agent who identifies a pattern and one by physical processes that induce an event. Provided these coincide, the probability is small, and the pattern can be identified independently of the event, we say the event exhibits complex specified information.

Complex specified information is therefore a souped-up form of information. To be sure, complex specified information is consistent with the basic idea behind information, which is the reduction or ruling out of possibilities from a reference class of possibilities. But whereas the traditional understanding of information is unary, conceiving of information as a single reduction of possibilities, complex specified information is a binary form of information. Complex specified information depends on a dual reduction of possibilities, a conceptual reduction (i.e., conceptual information) combined with a physical reduction (i.e., physical information). Moreover, these dual reductions must be coordinated so that the physical information matches the pattern set by the conceptual information. When they match, we have complex specified information.

4. From Complex Specified Information to Design

Complex specified information reliably detects design. To see this, we need to consider the nature of intelligent agency and, specifically, what it is about intelligent agents that makes them detectable. The principal characteristic of intelligent agency is choice. The very etymology of the word "intelligent" makes this clear. "Intelligent" derives from two Latin words, the preposition *inter*, meaning between, and the verb *lego*, meaning to choose or select. Thus, according to its etymology, intelligence consists in *choosing between*. For an intelligent agent to act is therefore to choose from a range of competing possibilities.

This is true not just of humans but of animals as well as of extraterrestrial intelligences. A rat navigating a maze must choose whether to go right or left at various points in the maze. When SETI researchers attempt to discover intelligence in the extraterrestrial radio transmissions they are monitoring, they assume an extraterrestrial intelligence could have chosen any number of possible radio transmissions, and then attempt to match the transmissions they observe with certain patterns as opposed to others. Whenever a human being utters meaningful speech, a choice is made from a range of possible sound-combinations that might have been uttered. Intelligent agency always entails discrimination, choosing certain things, ruling out others.

Given this characterization of intelligent agency, the crucial question is how to recognize it. Intelligent agents act by making a choice. How, then, do we recognize that an intelligent agent has made a choice? A bottle of ink spills accidentally onto a sheet of paper; someone takes a fountain pen and writes a message on a sheet of paper. In both instances ink is applied to paper. In both instances one among an almost infinite set of possibilities is realized. In both instances a contingency is actualized and others are ruled out. Yet in one instance we ascribe agency, in the other chance.

What is the relevant difference? Not only do we need to observe that a contingency was actualized, but we ourselves need also to be able to specify that contingency. The contingency must conform to an independently given pattern, and we must be able independently to construct that pattern. A random ink blot is unspecified; a message written with ink on paper is specified. To be sure, the exact message recorded may not be specified. But orthographic, syntactic, and semantic constraints will nonetheless specify it.

Actualizing one among several competing possibilities, ruling out the rest, and specifying the one that was actualized encapsulates how we recognize intelligent agency, or equivalently, how we detect design. Experimental psychologists who study animal learning and behavior have known this all along. To learn a task an animal must acquire the ability to actualize behaviors suitable for the task as well as the ability to rule out behaviors unsuitable for the task. Moreover, for a psychologist to recognize that an animal has learned a task, it is necessary not only to observe the animal making the appropriate discrimination, but also to specify the discrimination.

Thus, to recognize whether a rat has successfully learned how to traverse a maze, a psychologist must first specify which sequence of right and left turns conducts the rat out of the maze. No doubt, a rat randomly wandering a maze also discriminates a sequence of right and left turns. But by randomly wandering the maze, the rat gives no indication that it can discriminate the appropriate sequence of right and left turns for exiting the maze. Consequently, the psychologist studying the rat will have no reason to think the rat has learned how to traverse the maze.

Only if the rat executes the sequence of right and left turns specified by the psychologist will the psychologist recognize that the rat has learned how to traverse the maze. Now it is precisely the learned behaviors we regard as intelligent in animals. Hence it is no surprise that the same scheme for recognizing animal learning recurs for recognizing intelligent agency generally, to wit: actualizing one among several competing possibilities, ruling out the others, and specifying the one actualized.

Note that complexity is implicit here as well. To see this, consider again a rat traversing a maze, but now take a very simple maze in which two right turns conduct the rat out of the maze. How will a psychologist studying the rat determine whether it has learned to exit the maze? Just putting the rat in the maze will not be enough. Because the maze is so simple, the rat could by chance just happen to take two right turns, and thereby exit the maze. The psychologist will therefore be uncertain whether the rat actually learned to exit this maze or whether the rat just got lucky.

But contrast this with a complicated maze in which a rat must take just the right sequence of left and right turns to exit the maze. Suppose the rat must take one hundred appropriate right and left turns, and that any mistake will prevent the rat from exiting the maze. A psychologist who sees the rat take no erroneous turns and in short order exit the maze will be convinced that the rat has indeed learned how to exit the maze and that this was not dumb luck.

This general scheme for recognizing intelligent agency mirrors complex specified information. In general, to recognize intelligent agency we must observe an actualization of one among several competing possibilities, note which possibilities were ruled out, and then be able to specify the possibility that was actualized. What’s more, the competing possibilities that were ruled out must be live possibilities and sufficiently numerous so that specifying the possibility that was actualized cannot be attributed to chance. This is just another way of saying that the possibility that was actualized is complex. All the elements in this general scheme for recognizing intelligent agency (i.e., actualizing, ruling out, and specifying) therefore find their counterpart in complex specified information. It follows that complex specified information formalizes what it is that all along has enabled us to recognize intelligent agency. Complex specified information pinpoints how we detect design.

5. Displacement

Not everyone agrees. Darwinian naturalists, for instance, accept that biological systems exhibit complex specified information but deny that it results from intelligence. Rather, they contend that it results from a nonteleological process or mechanism (typically the Darwinian mechanism of natural selection and random variation). In effect, the Darwinian naturalist claims that nature is capable of generating complex specified information apart from intelligence. To see that nature has no such capacity, we need to understand the concept of *displacement* as it applies to information generally and complex specified information in particular.

The basic idea behind displacement is this: Suppose you need to search a space of possibilities. The space is so large and the possibilities individually so improbable that an exhaustive search is not feasible and a random search is highly unlikely to conclude the search successfully. In consequence, you need some constraints on the search—some information to help guide the search to a solution (think of an Easter egg hunt where no one provides hints or guidance versus one where someone directs you by saying "warm," "warmer," and "hot"). All such information that assists your search, however, resides in a search space of its own—an informational space. So the search of the original space gets *displaced* to a search of an informational space in which the crucial information for successfully searching the original space resides. Now it is a mathematical fact that such a higher-order informational space ("higher" with respect to the original search space) is always at least as big and at least as hard to search as the original space (for the details see chapter 4 of my book *No Free Lunch*). I call this *the displacement problem*.

Think of it this way. Imagine an island with buried treasure. You can scour the island trying to find the buried treasure. Alternatively, you can try to find a map that tells you where the treasure is buried. Once such a map is in hand, finding the treasure is no problem. But how to find such a map? For every place on the island there is a map with an "x" marking where the treasure could be located. There are also maps with directions such as "turn here, walk ten paces, then start to dig." The vast majority of such maps will be misleading and provide no help in locating the treasure. Indeed, a map that accurately informs us where the treasure is will be mixed among a huge assortment of misleading maps. The huge assortment of maps is the informational space associated with the original search space. Finding the right map within that huge assortment is no easier than simply searching the island directly (and in fact, mathematics tells us it will be more difficult).

It follows that constraining the search of an original space by employing information does not provide a nonteleological, design-free explanation for the success of that search. Instead, the solution found in the original space merely reflects the solution already in hand in a higher-order informational space. And if the one solution exhibits complex specified information, then so does the other (this follows from the simple fact that any information that identifies complex specified information is itself complex specified information—for the details see chapter 3 of *No Free Lunch*). In particular, when nonteleological processes output complex specified information, it is because they take preexisting complex specified information and merely re-express it. They are not generating it for free or from scratch. To claim otherwise is like filling one hole by digging another. If the problem was to be rid of holes period (i.e., design), then the problem hasn't been resolved but merely relocated.

Displacement implies that if you have some naturalistic process whose output exhibits complex specified information, then that process was front-loaded with complex specified information. The task of the information theorist in that case is to "follow the information trail" and show where the complex specified information that was outputted was first inputted. Displacement is essentially a bookkeeping device for keeping science honest about the sources of information. It forces us to show where complex specified information supposedly gotten for free has in fact been front-loaded, smuggled in, or hidden from view.

The existence of complex specified information in nature argues for real design in the world. But that raises the question, Who designed the designer? If the designer exhibits complex specified information, this would imply a "design regress" in which attributions to design based on complex specified information always give way to some other explanation. But in fact there is no reason to suppose that the designer responsible for complex specified information in nature is part of nature and therefore in turn exhibits complex specified information. Complex specified information refers to patterns embodied in physical structures. But if the designer is not a physical structure, the designer, though capable of bringing about complex specified information, would not in turn exhibit complex specified information. The very definition of complex specified information therefore precludes the "design regress" in which—to stay consistent with our methods of design detection—we must answer whether the designer is designed. The designer responsible for the complex specified information in nature is, as best we can tell, not an event, object, or structure. Consequently, the designer, though capable of producing phenomena that exhibit complex specified information, does not in turn exhibit complex specified information.

Who is the designer? As a Christian I hold that the Christian God is the ultimate source of design behind the universe (though that leaves open that God works through secondary causes, including derived intelligences such as angels or teleological processes). But there's no way for design inferences based on features of the natural world to reach that conclusion. Design inferred from complex specified information in nature is compatible with Christian belief but does not entail it. This is as it should be. Nature is silent about the revelation of Christ in Scripture. At the same time, nothing prevents nature from independently testifying to the God revealed in the Scripture. The complex specified information exhibited in natural phenomena is perhaps best thought of as God's fingerprints. Fingerprints never tell us the character of the one whose fingers are in question. But they can tell us that we are dealing with the fingers of an intelligence, and this in turn can lead us to inquire into the character of that intelligence. An information-theoretic design argument therefore doesn't so much lead us to God as remove us from paths that lead away from God.