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MECHANISM, MAGIC AND DESIGN

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SYNOPSIS

Science, we are told, studies natural causes. To introduce design into science is therefore to invoke a supernatural cause and abandon science. Science deals with natural causes — mechanisms. Religion deals with supernatural causes — magic. Because they are hopelessly irreconcilable, science must keep design outside its purview.

This distinction between mechanism and magic is flawed. The proper contrast is not between mechanism and magic or, alternatively, between natural and supernatural causes. The proper contrast is between *unintelligent causes* and *intelligent causes*.

Intelligent causes can do things that unintelligent causes cannot do. Unintelligent causes can throw *Scrabble* pieces on a board but cannot arrange the pieces to form meaningful words or sentences. To obtain a meaningful arrangement requires an intelligent cause. Whether an intelligent cause operates within or outside nature (i.e., is natural or supernatural) is a question separate from whether an intelligent cause has acted. Intelligent causes are detectable. In fact, we have reliable methods for detecting them, and their detection involves no recourse to the supernatural. Affirming intelligent design is common, rational, and objectifiable and no magic is required.

Robert Pennock is a philosopher with a mission — he wants to keep science safe from intelligent design. His most recent book, *Tower of Babel*, was nominated for the Pulitzer Prize and targeted Phillip Johnson's "intelligent design creationism," as Pennock calls it. [1]

What is intelligent design? Intelligent design (ID) is a scientific research program that investigates the effects of intelligent causes. Note that ID studies the *effects* of intelligent causes and not intelligent causes *per se*. ID does not try to get into the head of a designing intelligence; rather, it looks at what a designing intelligence does and draws inferences therefrom.

Intelligent design is both old and new. It's old because many sciences already fall under ID. Forensic science, intellectual property law, cryptography, random number generation, and the SETI program (Search for Extra-Terrestrial Intelligence) all look at features of the world and try to infer an intelligent cause responsible for those features. Where ID gets controversial is when one takes its methods for detecting design in human contexts and shifts them to the natural sciences where nothing humanlike could have been present. What if, for instance, the methods of ID are applied to biology and show that biological systems are designed? The application of ID to the natural sciences is both novel and threatening and has prompted full-scale rebuttals such as Pennock's.[2]

ID: THREAT TO MECHANISM

ID threatens the scientific establishment because ever since Darwin, scientists have increasingly assumed that a divine architect was not needed to start creation on its course. Consequently, any designing agents, including ourselves, must result from a long evolutionary process that itself was not designed. According to this view, designing agents such as ourselves occur at the end of an undesigned natural process and cannot be prior to it.

If there is design in biology and cosmology, that design could not be an evolved intelligence. Instead, it must be a transcendent intelligence. Enter "the big G." If there's a designer behind biology and cosmology, the options for who that designer is are limited, with God being the preferred option. Yet for God to play a substantive role in science is more than most scientists can handle. Hence the increasing attacks against ID, such as the one by Pennock.

What underlies these critiques is one main worry: To permit a transcendent designer into science will destroy science, reintroducing magical, superstitious, and occult entities that modern science had banished from our understanding of the world. Pennock aptly expresses this worry. In criticizing Phillip Johnson, Pennock points to a particularly worrisome legal consequence of Johnson's views on intelligent design. According to Pennock, Johnson advocates "that science admit the reality of supernatural influences in the daily workings of the world."[3]

What if the same reasoning that Johnson is trying to import into science were adopted into Johnson's own area of specialization — law (Johnson is a law professor at UC Berkeley)? Here's the concern as Pennock lays it out in *Tower of Babel*:

For the law to take [Johnson's view] seriously as well, it would have to be open to both suits and defenses based on a range of possible divine and occult interventions. Imagine the problems that would result if the courts had to accept legal theories of this sort. How would the court rule on whether to commit a purportedly insane person to a mental hospital for self-mutilation who claims that the Lord told her to pluck out her eye because it offended her? How would a judge deal with a defendant, Abe, accused of attempted murder of his son, Ike, who claims that he was only following God's command that he kill Ike to prove his faith?[4]

Implicit in this passage and throughout Pennock's book is a forced choice between mechanism and magic: either the world works by mechanisms that obey inviolable natural laws and that admit no break in the chain of natural causation, or the world admits supernatural interventions that ruin science and our understanding of the world, and pandemonium breaks loose (including in legal studies). Pennock is offering his readers mechanism while Johnson is offering them magic. Any reasonable person knows which option to choose.

As with most forced choices, however, Pennock has conveniently ignored a *tertium quid*, which, when properly understood, shows that the real magician is Pennock and not Johnson. The *tertium quid* is intelligent design, which is entirely separable from magic. Pennock knows that design is an old notion that requires neither magic nor miracles nor a creator.[5] Intelligent design is detectable. In fact, we have reliable methods for detecting it, and its detection involves no recourse to the supernatural. Design is common, rational, and objectifiable.[6]

Indeed, there exists a rigorous criterion for discriminating intelligently from unintelligently caused objects. Many special sciences already use this criterion, though an intuitive form of it (e.g., forensic science, artificial intelligence, cryptography, archeology, and the Search for Extra-Terrestrial Intelligence). What intelligent design does is make precise this criterion and apply it in sciences such as biology. I refer to this criterion as the *complexity-specification criterion*. When intelligent agents act, they leave behind a characteristic trademark or signature known as *specified complexity*.[7] The complexity-specification criterion detects design by identifying this key trademark of designed objects.

DETECTING DESIGN THROUGH SPECIFIED COMPLEXITY

A detailed exposition of the complexity-specification criterion is discussed in *The Design Inference*.[8] Though technical, its basic idea is straightforward and easily illustrated. Consider how the radio astronomers in the movie *Contact* detected an extraterrestrial intelligence. This movie, based on a novel by Carl Sagan, was an enjoyable piece of propaganda for the SETI research program (the Search for Extra-Terrestrial Intelligence). In this film, the SETI researchers discovered an extraterrestrial intelligence (the *non*fictional SETI program has yet to be so lucky).

To increase their chances of finding an extraterrestrial intelligence, SETI researchers monitor millions of radio signals from outer space. Many natural objects in space produce radio waves (e.g., pulsars). Looking for signs of design among all these naturally produced radio signals is like looking for a needle in a haystack. To sift through the haystack, SETI researchers run these signals through computers programmed with pattern-matchers. As long as a signal doesn't match one of the preset patterns, it will pass through the pattern-matching sieve (even if it has an intelligent source). If it does match one of these patterns, then, depending on the pattern matched, the SETI researchers may have cause for celebration.

The SETI researchers in *Contact* did find a signal worthy of celebration, namely the following:

1101110111110111111101111111111101111111111110111111111111111101111111111111111111011111111
1111111111111101111111111111111111111111111110111111111111111111111111111111101111111111111
1111111111111111111110111111111111111111111111111111111111111111101111111111111111111111111
1111111111111101111111111111111111111111111111111111111111111111101111111111111111111111111
1111111111111111111111011111111111111111111111111111111111111111111111111111111111111110111111
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1111111111111111111101111111111111111111111111111111111111111111111111111111111111111111111111
1111111101111111111111111111111111111111111111111111111111111111111111111111111111111111111110
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111110111
1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
1011111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111

The *Contact* SETI researchers received this signal as a sequence of 1,126 beats and pauses, where 1s correspond to beats and 0s to pauses. This sequence represents the prime numbers from 2 to 101, where a given prime number is represented by the corresponding number of beats (i.e., 1s), and the individual prime numbers are separated by pauses (i.e., 0s). These SETI researchers took this signal as decisive confirmation of an extraterrestrial intelligence.

What about this signal indicates design? Whenever we infer design, we must establish two factors: *complexity* and *specification*. To see why complexity is crucial for inferring design, consider the following sequence of bits:

110111011111

These are the first 12 bits in the previous sequence representing the prime numbers 2, 3, and 5 respectively. Certainly no SETI researcher, if confronted with this 12-bit sequence, is going to contact the science editor at the *New York Times*, hold a press conference, and announce that an extraterrestrial intelligence has been discovered.

The problem is that this sequence is too short (and thus too simple) to establish that an extraterrestrial intelligence with knowledge of prime numbers produced it. A randomly beating radio source could output this sequence by chance. A sequence of 1,126 bits representing the prime numbers from 2 to 101, however, is a different story. Here the sequence is sufficiently long (and therefore sufficiently complex) that only an extraterrestrial intelligence could have produced it.

Such complexity is a form of probability. To see the connection between complexity and probability, consider a combination lock. The more possible combinations of the lock, the more complex the mechanism and, correspondingly, the more improbable that the mechanism can be opened by chance. To determine whether something is sufficiently complex to implicate design is thus to determine whether it has sufficiently small probability.

Even so, complexity (or improbability) isn't enough to eliminate chance and establish design. If I flip a coin 1,000 times, I'll participate in a highly complex (i.e., highly improbable) event. Indeed, the sequence I end up flipping will be one in a trillion trillion trillion..., where the ellipsis needs 22 more "trillions." This sequence of coin tosses won't, however, trigger a design inference. Though complex, this sequence won't exhibit a suitable pattern. Contrast this with the previous sequence representing the prime numbers from 2 to 101. Not only is this sequence complex, but it also embodies a suitable pattern. The SETI researcher who discovered this sequence in *Contact* put it this way: "This isn't noise, this has structure."

What is a *suitable* pattern for inferring design? Not just any pattern will do. Some patterns can legitimately be employed to infer design whereas others cannot. The intuition underlying the distinction between patterns that alternately succeed or fail to implicate design is, however, easily motivated. Consider the case of an archer. Suppose

an archer stands 50 meters from a large wall, which is sufficiently large so that the archer cannot help hitting it. Now suppose each time the archer shoots an arrow at the wall, the archer paints a target around the arrow so that the arrow sits squarely in the bull's-eye. What can we conclude from this scenario? Absolutely nothing about the archer's ability as an archer. Yes, a pattern is being matched, but it is a pattern fixed only after the arrow has been shot. The pattern is thus purely *ad hoc*.

Suppose, however, the archer paints a fixed target on the wall, then shoots a hundred arrows at it, and each time hits a perfect bull's-eye. Confronted with this second scenario, we must infer that he or she is a world-class archer, whose shots cannot legitimately be attributed to luck but rather to the archer's skill and mastery, which are instances of design.

The type of pattern where an archer fixes a target first and then shoots at it is common to statistics. It is known as setting a *rejection region* prior to an experiment. In statistics, if the outcome of an experiment falls within a rejection region, the chance hypothesis supposedly responsible for the outcome is rejected. The reason for setting a rejection region prior to an experiment is to forestall what statisticians call "data snooping" or "cherry picking." Just about any data set will contain strange and improbable patterns if we look hard enough. By forcing experimenters to set their rejection regions prior to an experiment, the statistician protects the experiment from spurious patterns that could result from chance.

A little reflection makes clear that a pattern need not be given prior to an event to eliminate chance and implicate design. Consider the following cipher text:

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nfuijolt ju jt mjlf b xfbtfm

Initially this looks like a random sequence of letters and spaces, but suppose we treat this sequence as a Caesar cipher, moving each letter one notch down the alphabet. Now the sequence reads:

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methinks it is like a weasel

Even though this pattern is given after the fact, it still is the right sort of pattern for eliminating chance and inferring design. In contrast to statistics, which always identifies its patterns before an experiment is performed, cryptanalysis must discover its patterns after the fact. In both instances, however, the patterns are suitable for inferring design.

For a pattern to count as a specification, it is not important when the pattern was identified, but whether it is *independent* of the event it describes. Drawing a target around an arrow already embedded in a wall is not independent of the arrow's trajectory. Consequently, such a pattern cannot be used to attribute the arrow's trajectory to design. Patterns that are specifications cannot simply be read off the events whose design is in question. In other words, it is not enough to identify a pattern simply by inspecting an event and noting (i.e., "reading off") its features. Rather, patterns must be suitably independent of events to count as specifications. I refer to this relation of independence as *detachability* and say that a pattern is *detachable* if and only if it satisfies that relation.

Detachability can be understood by asking, "Given an event whose design is in question and a pattern describing it, would we be able to construct that pattern if we had no knowledge which event occurred?" Here is the idea. An event has occurred. A pattern describing the event is given. The event is one from a range of possible events. If all we knew was the range of possible events without any specifics about which event actually occurred (e.g., we know that tomorrow's weather will be rain or shine, but we don't know which), could we still construct the pattern describing the event? If so, the pattern is detachable from the event.

Patterns thus divide into two types, those that warrant a design inference in the presence of complexity and those that do not warrant a design inference despite the presence of complexity. The first type of pattern I call a *specification*, the second a *fabrication*. Specifications are the non-*ad hoc* patterns that can legitimately be used to eliminate chance and warrant a design inference. In contrast, fabrications are the *ad hoc* patterns that cannot

legitimately be used to warrant a design inference. This distinction between specifications and fabrications can be made with full statistical rigor.[9]

To sum up, the complexity-specification criterion detects design by establishing complexity and specification. When called to explain an event, object, or structure, we have to decide whether to attribute it to design. According to the complexity-specification criterion, to answer this question is to break it into two separate questions: Is it complex? Is it specified?

WHO'S GOT THE MAGIC?

Specified complexity is a form of information and falls within the information sciences.[10] Design theorists therefore have a bonafide information-theoretic criterion for detecting design. Robert Pennock and evolutionary naturalists, however, lack a well-supported scientific theory. Instead, they espouse a form of magic that masquerades as a scientific theory. Indeed, the real magician in Pennock's *Tower of Babel* is not Phillip Johnson and design theorists, but rather Pennock himself and other evolutionary naturalists.

There are at least three forms of magic. One is the art of illusion, where appearance is crafted to distort reality. As entertainment, this form of magic is unobjectionable. Another form of magic is to invoke the supernatural to explain a physical event. To call this magic is a recent invention and makes most theists into magicians. (Was Thomas Aquinas a magician for accepting the resurrection of Jesus as a historical fact?) According to Pennock, intelligent design is guilty of this form of magic. Nonetheless, as a professional philosopher Pennock must realize that intelligent design can avoid this charge.

Pennock is guilty of his own form of magic, however. This third form of magic is the view that something can come from nothing. The "nothing" here need not be an absolute nothing; and the transformation of nothing into something may involve minor expenditures of effort. For instance, the magician may utter "abracadabra" or "hocus-pocus." Likewise, the Darwinian just-so stories that attempt to account for complex, information-rich biological structures are incantations that give the illusion of solving a problem but merely cloak ignorance.

Darwinists, for instance, explain the human eye as having evolved from a light sensitive spot that successively became more complicated as increased visual acuity conferred increased reproductive capacity on an organism.[11] In such a just-so story, all the historical and biological details in the eye's construction are lost. How did a spot become innervated and thereby light-sensitive? How did a lens form within a pinhole camera? With respect to embryology, what developmental changes are required to go from a light-sensitive sheet to a light-sensitive cup? None of these questions receive an answer in purely Darwinian terms. Darwinian just-so stories are no more enlightening than Rudyard Kipling's original just-so stories about how the elephant got its trunk. Such stories are entertaining, but they hardly engender profound insight.

The great appeal behind this third form of magic is the offer of a bargain — indeed, an incredible bargain for which no amount of creative accounting can ever square the books. The idea of getting something for nothing has come to pervade science. In cosmology, Alan Guth, Lee Smolin, and Peter Atkins all claim that this marvelous universe could originate from quite unmarvelous beginnings (a teaspoon of ordinary dust for Guth, black-hole formation for Smolin, and set-theoretic operations on the empty set for Atkins).[12] In biology, Jacques Monod, Richard Dawkins, and Stuart Kauffman claim that the panoply of life can be explained in terms of quite simple mechanisms (chance and necessity for Monod, cumulative selection for Dawkins, and autocatalysis for Kauffman).[13]

We have become so accustomed to this something-for-nothing way of thinking that we do not appreciate just how magical it is. Consider the following evolutionary account of neuroanatomy by Melvin Konner, an anthropologist and neurologist at Emory University: "Neuroanatomy in many species — but especially in a brain-ridden one like ours — is the product of sloppy, opportunistic half-billion year [evolution] that has pasted together, and only partly integrated, disparate organs that evolved in different animals, in different eras, and for very different purposes."[14] Since human consciousness and intelligence are said to derive from human neuroanatomy, it follows that these themselves are the product of a sloppy evolutionary process.

Think what this means. How do we make sense of "sloppy," "pasted together," and "partly integrated," except with reference to "careful," "finely adapted," and "well integrated." To speak of hodge-podge structures presupposes that we have some concept of carefully designed structures; and, of course, we do. Humans have designed all sorts of engineering marvels, everything from Cray supercomputers to Gothic cathedrals. That means, if we are to believe

Melvin Konner, that a blind evolutionary process (what Richard Dawkins calls the "blind watchmaker") cobbled together human neuroanatomy, which in turn gave rise to human consciousness, which in turn produces artifacts like supercomputers, which in turn are not cobbled together at all but instead are carefully designed. Out pop purpose, intelligence, and design from a process that started with no purpose, intelligence, or design. This is magic.

Of course, to say this is magic is not to say it is false. It is after all a logical possibility that purpose, intelligence, and design emerged by purely natural means out of a physical universe initially devoid of these qualities. Intelligence, for instance, may just be a survival tool given to us by an evolutionary process that places a premium on survival and that is itself not intelligently guided. The basic creative forces of nature might be devoid of intelligence; yet if that is so, how can we know it? If it is not so, how can we know that? It does no good simply to presuppose that purpose, intelligence, and design are emergent properties of a universe that initially is devoid of these.

Whether nature has been front-loaded with purpose, intelligence, and design is not a new debate — the ancient Epicureans and Stoics engaged in it. The Stoics argued for a design-first universe: the universe starts with design and any subsequent design results from the outworkings of that initial design. The Epicureans argued for a design-last universe: the universe starts with no design and any subsequent design results from the interplay of chance and necessity.[15]

What is new, at least since the Enlightenment, is that it has become intellectually respectable to cast the design-first position as disreputable, superstitious, and irrational; and the design-last position as measured, parsimonious, and alone supremely rational. Indeed, the charge of magic is nowadays typically made against the design-first position and not against the design-last position, as I have done here.

Why should the design-first position elicit the charge of magic? Historically in the West, design has principally been connected with Judeo-Christian theism. The God of Judaism and Christianity is said to introduce design into the world by intervening in its causal structure. Such interventions cannot be anything but miraculous, and miracles are the stuff of magic. So goes the argument, which is flawed because there is no necessary connection between God introducing design into the world and God intervening in the world in the sense of violating its causal structure (which is not to endorse deism; but there are separate reasons for preferring theism over deism, notably the miracles in salvation history). Theists such as Richard Swinburne, for instance, argue that God front-loads design into the universe by designing the very laws of nature.[16] Paul Davies takes a similar line.[17] Restricting design to structuring the laws of nature precludes design from violating those laws and thus violating nature's causal structure.

Design easily resists the charge of magic. Rather, it's the *a priori* exclusion of design that has a much tougher time resisting it. Indeed, the design-last position is inherently magical. Consider the following remark by Harvard biologist Richard Lewontin in *The New York Review of Books*:

We take the side of science in spite of the patent absurdity of some of its constructs, in spite of its failure to fulfill many of its extravagant promises of health and life, in spite of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a prior commitment, a commitment to materialism. It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counterintuitive, no matter how mystifying to the uninitiated.[18] *(emphases in original)*

If this isn't magic, what is?

Nevertheless, the scientific community continues to be skeptical of design. The worry is that design will give up on science. In place of a magic that derives something from nothing, design substitutes a designer who explains everything. Magic gets you something for nothing and thus offers a bargain. Design gets you something by presupposing something unimaginably bigger and thus asks you to sell your scientific soul. Design, however, can be explanatory without giving away the store. Certainly this is the case for human artifacts, which are properly explained by reference to design. Nor does design explain everything. There's no reason to invoke design to explain a random inkblot; but a Dürer woodcut is something else altogether. The point of the intelligent design research program is to extend design from the realm of human artifacts to the natural sciences. The program may ultimately

fail, but it is only now being tried and it is certainly worth a try. Moreover, specified complexity gives this program a rigorous information-theoretic underpinning.

Just as truth is not decided at the ballot box, so truth is not decided by the price one must pay for it. Bargains are all well and fine, but ultimately you get what you pay for. Some areas of science are open to bargain-hunting and some are not. Self-organizing complex systems, for instance, are a great place for scientific bargain-hunters to shop. Bénard cell convection, Belousov-Zhabotinsky reactions, and a host of other self-organizing systems offer complex organized structures apparently for free.[19] There are other areas of science, however, that frown upon bargain-hunting. The conservation laws of physics, for instance, allow no bargains. The big question confronting design is whether it can be bought cheaply or must be paid for at full value. Design theorists argue that design admits no bargains.

Pennock and evolutionary naturalists are bargain hunters. They want to explain the appearance of design in nature without admitting actual design. That's why Richard Dawkins begins *The Blind Watchmaker* by saying, "Biology is the study of complicated things that give the appearance of having been designed for a purpose."[20] He then requires an additional 350 pages to show why it is only an appearance of design. Pennock and evolutionary naturalists certainly haven't demonstrated that they are right. Indeed, they are nowhere near pulling the rabbit out of the hat.

The smart money is on design.

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Notes

1 Robert Pennock, *Tower of Babel* (Cambridge, MA: MIT Press, 1999).
2 See also Kenneth Miller, *Finding Darwin's God* (New York: Harper Collins, 1999).
3 Pennock, 295.
4 Ibid.
5 See F. H. Sandbach, *The Stoics*, 2d ed. (Indianapolis: Hackett, 1989), especially chap. 4.
6 See William A. Dembski, ed., *Mere Creation* (Downer's Grove, IL: InterVarsity Press, 1998).
7 William A. Dembski, *Intelligent Design* (Downer's Grove, IL: InterVarsity Press, 1999), chap. 5.
8 William A. Dembski, *The Design Inference* (Cambridge: Cambridge University Press, 1998). In *The Design Inference*, I develop a "specification/small probability criterion," which is equivalent to the complexity-specification criterion described here.
9 Dembski, *The Design Inference*, chap. 5.
10 Dembski, *Intelligent Design*, chap. 6.
11 See Richard Dawkins, *The Blind Watchmaker* (New York: Norton, 1987), 85–86.
12 See respectively Alan Guth, *The Inflationary Universe* (Reading, MA: Addison-Wesley, 1997); Lee Smolin, *The Life of the Cosmos* (New York: Oxford University Press, 1997); Peter Atkins, *Creation Revisited* (Harmondsworth, UK: Penguin, 1994).
13 See respectively Jacques Monod, *Chance and Necessity* (New York: Vintage, 1972); Dawkins, *The Blind Watchmaker*; Stuart Kauffman, *At Home in the Universe* (New York: Oxford University Press, 1995).
14 Quoted in Moshe Sipper and Edmund Ronald, "A New Species of Hardware," *IEEE Spectrum* 37(4), April 2000: 59.
15 See Sandbach, 14–15.
16 Richard Swinburne, *The Existence of God* (Oxford: Clarendon, 1979), chap. 8, entitled "Teleological Arguments."
17 Paul Davies, *The Mind of God* (New York: Touchstone, 1992), chap. 8, entitled "Designer Universe."
18 Richard Lewontin, "Billions and Billions of Demons," review of *The Demon-Haunted World: Science as a Candle in the Dark* by Carl Sagan, *The New York Review of Books*, 9 January 1997, 31.
19 For instance, see Peter Coveney and Roger Highfield, *Frontiers of Complexity* (New York: Fawcett Columbine, 1995).
20 Dawkins, 1.