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**Can There be Purpose in a World of Chance?**

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**Overview**

Everywhere we look in our culture we see the fingerprints of chance or randomness. Obvious examples include the gaming industry (including lotteries), stage plays, movies, literature, television shows, historical scholarship, weather forecasting, the economy and music. Chance is also a fundamental component in many scientific theories such as evolution and quantum mechanics. It is somewhat ironic to note that both atheists and Christians use the possible existence of chance as evidence that there can be no God and as such it has become a favored weapon for those viewing science and religion as locked in mortal combat. However, what is chance, really? Science has shown us many examples of how order emerges from randomness and vice versa. In fact, we humans use random processes to achieve any number of purposes. Might God do the same? That is, use chance to achieve his purposes? There have been a number of Christian responses that attempt to incorporate chance into the traditional view of God.

**Chance has become an integral part of contemporary culture**

*Gaming*

One of the most obvious ways that chance is evident in contemporary culture is in the gaming industry; in fact, the vast majority of states sponsor lotteries as money-making enterprises to support education, health care or the state's general fund.

*Theater*

But chance can be found in DNA of stage plays such as *Hapgood* by Tom Stoppard or *Copenhagen* by Michael Frayn.

*Movies*

Movies are rife with plots centered around randomness. The movie website IMDb describes an interesting, though profane German movie titled *Run Lola Run* this way:

 Lola receives a phone call from her boyfriend Manny. He lost 100,000

 Deutschmarks [that belong to a very bad guy] in a subway train... Lola has 20

 minutes to raise this amount and meet Manny. Otherwise, he will rob a store

 to get the money. Three different alternatives may happen depending on some

 minor event along Lola's run. (http://www.imdb.com/title/tt0130827/)

A similar plot device is used in the Gwenyth Paltrow film, *Sliding Doors*. An older movie, *The Butterfly Effect*, builds its plot around chaos theory. Chaos theory is an example of how unpredictable outcomes can result from a deterministic system when very subtle changes are made to the variables input into that system. There will be more to say about chaos theory later.

*Literature*

Classic stories such as *Middlemarch* (George Eliot) and *Chance* (Joseph Conrad) use chance as a framework upon which to weave a complex tale. For example, one website describes Conrad's book this way:

 The principal theme, chance, is amply illustrated both explicitly and implicitly

 in the novel. The many chances each of the characters has are folded into

 Marlow's newfound or newly formulated philosophy which he expresses to

 Powell near the novel's end: Reminding Powell that they got to know each

 other by chance, Marlow states, "And the science of life consists in seizing

 every possible chance that presents itself." Marlow also has altered, very

 slightly, his position on humanity through his pondering of chance and

 concludes his lengthy tale by anticipating that Powell and Flora will be

 married: he says to his listener, "What on earth are you grinning at in this

 sarcastic manner? I am not afraid of going to church with a friend. Hang it

 all, for all my belief in Chance I am not exactly a pagan." (http://www.bookrags.com/Chance\_(Conrad))

*Television*

Television shows are full of examples of chance and randomness. Older shows that made frequent reference to uncertainty include *The X-Files* and *Numb3rs*, though newer shows such as *Touch* and *Perception* are making more frequent use of chance in their storylines.

*History*

Historians have been particularly interested in the role of chance in the unfolding of historical events. Two of the better books are, *The Hinge Factor: How Chance and Stupidity Have Changed History* (Erik Durschmied) and *For Want of a Horse: Choice & Chance in History* (John M. Merriman, ed.). The latter book speculates (often with a great deal of humor) on what might have been different in history had one or two small events changed, by chance.

*Weather Forecasting*

This is one of the first aspects of everyday life that many people were exposed to uncertainty or unpredictability. Of course, everyone knows that the weather is fundamentally unpredictable but it was not that many years ago when science gave forecasters that ability to quantify that level of uncertainty via statements such as, "There is a 40% chance of rain today."

*The iPod Shuffle*

Even seemingly indispensible products of technology such as the iPod have shuffle functions allowing the user to be surprised by the next piece of music to pop up, adding to the pleasure of the listening experience.

*Economics*

Few have to be convinced at this point in time of the unpredictability and volatility of the world economy. In fact, despite all of the high paid brokers and day traders who argue differently, it is nothing new for financial analysts and economists to describe the investment world as being governed by chance (e.g., *A Random Walk Down Wall Street* by Burton G. Malkiel).

*Music*

Even rock 'n' roll has not been immune to the lure of chance as a lyrical device. Though the music sounds somewhat dated the song *Free Will* is a good example of music reflecting a culture enamored with chance.

*Chance*

In sum, think for a moment about all of the words in the English language that reflect the notion of chance or randomness. Those words on the slide represent only a few; surely additional examples can be identified. However, this alone should indicate how influential chance is in our daily lives.

**Chance has become an integral part of contemporary science**

*Darwin, Einstein, Heisenberg, Bohr*

These scientists and their theories serve as exemplars of the role of chance in science. Charles Darwin, of course, is associated with the theory of evolution and natural selection. Randomness enters into this theory in two ways. First, variety enters into the evolutionary development of life through random mutations. This could be something as obscure as an atomic particle damaging the genetic material of an animal that is then passed on to offspring instigating a potential change in the adaptability of that species to environmental conditions. Or, there may simply be a mistake in the genetic copying of the DNA in cell division. These genetic mutations may be positive, negative or neutral from the perspective of the species. Secondly, chance occurs in natural selection as these genetic mutations are selected for (or against) depending upon the environment within which they occur any advantage (or disadvantage) accrues as a result.

Werner Heisenberg and Niels Bohr are the primary personalities behind the develop of quantum theory. Whereas classical or Newtonian physics explains the mechanics of the macro, or large object, physical universe quantum theory describes the physical relationships at the atomic level. Heisenberg is best known for his Uncertainty Principle which states that there is a fundamental degree of insurmountable uncertainty at the foundation of the universe. Because observing the behavior of quantum (smallest) particles influences their position or velocity the Uncertainty Principle says that if we know a quantum particles velocity we cannot know its position and vice versa. The vast majority of contemporary physicists share this "uncertain" interpretation of quantum mechanics; this is known as the Copenhagen interpretation. They argue that at the quantum level much knowledge is probabilistic in nature. In fact, some physicists have gone so far as to adopt a non-realist philosophical position where they accept a non-deterministic view of the physical world which leads to the denial of cause-and-effect relationships under certain circumstances (i.e., there may be effects with causes, what some refer to as "pure chance"). Einstein never accepted this interpretation of quantum mechanics; he famously said that, "God doesn't play dice with the universe."

*Father Stanley Jaki: Physicist, Jesuit Priest*

The late Fr. Jaki points out that in the decade or so after the explication of the Uncertainty Principle by Heisenberg quantum uncertainty was interpreted as ignorance of causes. However, within just a few years many physicists [unjustifiably in Jaki's opinion] began to shift toward the non-realist view of the Principle, that is, cause-and-effect breaks down at the quantum level and we see pure chance, a purely non-deterministic reality.

*T.H. Huxley: Darwin's Bulldog*

Even the staunchest supporter of Darwin's theory and its inherent randomness never believed that this uncertainty in nature reflected our ignorance of causes, not an absence of causes.

*Jacques Monod: Biochemist, Nobel Laureate*

Some contemporary scientists take the random processes built into the natural world as evidence that there is no purpose or plan behind creation.

*R.C. Sproul: Calvinist Theologian, Pastor*

Some theologians agree with Monod insofar as they believe that the presence of chance in the universe seems to deny purpose and therefore also the existence of a providential God, such as the God worshipped by Christians.

**Chance has become a major weapon of those who regard science and theology as locked in mortal combat.**

*Bridging Sproul's Theology with Monod's Science*

So, is chance a threat to God's sovereignty or does the presence of randomness go so far as to eliminate the need for God? That is, regardless of whether or not we are a person of faith is chance the antithesis of purpose?

*A Brief History of Chance*

Just as an aside consider chance in the history of civilization, in the broadest and most general of terms. Ancient civilizations were polytheistic believing in many gods. When unexplained phenomena occurred be it thunder and lightening or a storm at sea, in lieu of a natural explanation, people attributed the acts to various gods. Often these gods were seen as capricious, toying with humans. So, ancients lived with a Chance Worldview, a view of life that acknowledged many unpredictable events, yet it was a *causal* view of the world. In other words, much of the chance in life was caused by the gods which were to be placated if undesirable experiences were to be minimized.

Western civilization eventually moved into a Christian Worldview. For sixteen hundred years or so many people on earth saw the world as in the hands of the all-powerful, all-knowing God of Christianity. Ultimately, in the Enlightenment, God's sovereignty was reflected in a clockwork image of the universe; creation was a machine that, so it was believed, could be ultimately understood in nearly complete detail by science.

The Scientific Worldview ushered in by the Enlightenment had the ironic influence of removing the need for God from any aspect of its "day-to-day" maintenance; God was relegated from creator and sustainer to simply creator. Some scientists during this period transitioned from a theistic belief of a personal God to a deistic belief in only a creator God. Notice, however, that whether in the Christian Worldview or the Scientific Worldview creation was seen as fundamentally causal in nature, a realist philosophical position.

In contemporary culture, what some have referred to as post-modern, humanity has come full circle. Once again many view life and creation through the prism of a Chance Worldview. Unlike the ancients, however, this time around many people (most especially physicists) see the possibility of a-causal processes and outcomes in creation, what has been previously referred to as *pure chance*.

**What is chance?**

There are many definitions of chance; every dictionary defines it slightly differently. For example, Dictionary.com says that chance is "the absence of any cause of events that can be predicted, understood, or controlled." Note, and this is important, chance is not itself a cause of anything but rather the absence, or ignorance, of a cause or causes. A much more pragmatic definition has been given by Chris Baglow (*Faith, Science & Reason: Theology on the Cutting Edge*): chance is "the intersection of two or more lines of causality that are independent of each other, in a way that is accidental and unintended by the agents involved." For example, imagine roofers working on top of a house. The woman inside decides to walk to the street-side mailbox to get her mail. Upon stepping off the front porch one of the roofers drops his tape measure which slides down the roof, off the edge and bops the woman on the head as she walks off the last step. This would be viewed by most as a chance event or an accident. In reality, two well-defined chains of causal events intersected in space and time leading to this chance event: the roofer dropping the tape measure which slid down the roof and dropped of the edge and the woman walking out the front door of her home, down the steps and on to the front walk. The unanticipated intersection of these two very deterministic causal chains accounts for what is called a chance event in this case.

*Chance as the Ignorance of Causes*

The statistician Persi Diaconis had engineers build a coin flipping machine. What he found was that if a coin is flipped in exactly the same way it will land in exactly the same way. So, whereas the outcome of a coin toss is seen as a random or chance event, in fact, it is determined by physical processes that are generally out of our control. Therefore, for all practical purposes, the outcome is unpredictable; we are simply ignorant of the causes.

The failed assassination attempt of Hitler, as chronicled by the movie *Valkyrie*, is an example of historical contingency or accident. The very deterministic course of events which led to the moving of the explosive therefore led to the failure of the plot to kill Hitler. Again, this is simply an example of chance as the ignorance of causes.

*Chance as the Absence of Causes*

Though controversial, the predominant view of physicists (i.e., the Copenhagen school) is that the release of atomic particles in radioactive decay is not only unpredictable but that there can be no known cause. This is about as close as one can come to a non-realist philosophical position that posits an effect without a cause.

*Order Out of Chaos (Statistical Laws)*

The simple tossing of a fair coin and insurance are two examples of how order can arise out of randomness or chance. There'll be more to say about coin tossing shortly. As for insurance, no one can predict when you or I will pass from this world. That particular outcome is for all practical purposes unpredictable. However, insurance companies (and their actuaries) make a living off of the very predictable nature of aggregates or groups of people. For example, an insurance company may have no way of knowing when a particular 50-year-old African-American male will pass away, however, they can very accurately predict what percentage of 50-year-old African-American males will die in any particular year. So, what is unpredictable at the individual level is quite predictable in the aggregate. Another example might be the gas laws. Whereas the motion of individual air molecules is unpredictable their aggregate behavior is not; if we double the pressure on a volume of gas its volume will decrease by half, if temperature is held constant.

Coin tossing provides a particularly fascinating example of order out of randomness. Most people know that in a single toss of a fair coin there is a 50-50 chance of obtaining a head (or, a tail); this is illustrated by the bar chart in the upper left. As you move from left to right in the bar charts you can see how the distribution of the number heads changes as the number of tosses increases. For example, in the second chart you can see that in two tosses of a fair coin there is there is a 25% chance of getting no head and a 25% chance of getting two heads; there is a 50% chance of getting only one head. The next three graphs illustrate the distribution of the number of heads in three, four and five tosses of a coin. In the bottom graph, the distribution of heads in twenty-five tosses of a coin is illustrated. There is a 15.5% chance of getting either 12 or 13 heads in twenty-five tosses; as we consider a greater number of heads or a lesser number of heads the probabilities decrease with a near zero chance of getting either no or twenty-five heads in twenty-five tosses.

Another example concerns runs in a series of coin tosses. For example, imagine that in a series of heads/tails outcomes we count up the length of runs of tails. Each head counts as a zero run of tails. Notice the very orderly distribution of run lengths decreasing from zero in a geometric progression.

Yet another example would be to take a series of coin tosses, as before, but this time divide them into groups of four (the number four is arbitrary; the same can be demonstrated for any group size) and count the number of heads that occur in each group: 0, 1, 2, 3, or 4. Once again notice the very orderly nature of the [binomial] distribution of outcomes.

A similar but less contrived example of order out of chance is the distribution of the ratio of male to female births. Taking a look at the census statistics on birth rates in the U.S. from 1980 through 2008 it is apparent that despite the up-and-down nature of the absolute numbers of live births there is a constant 105 male births for every 100 female births. This type of order out of randomness is evident in many other social statistics.

So, does lawful behavior (in the form of statistical laws) emerge naturally from underlying chaos? That is, is chaos a precondition of the order which speaks so eloquently of the divine mind? Many people tend to see the orderliness in the universe around us as indicative of a master plan, as evidence of the hand of God in creation. However, is it possible that the order that we see all around us is actually built on a foundation of randomness?

Our discussion would be incomplete if we didn't consider the opposite situation: chaos out of order. Imagine that I decide to walk out the front door of my house, down the steps and out to the mailbox. However, at the same time that I step outside a worker on my roof drops his tape measure that slides down the roof, over the edge and bonks me on the head. Here we have an example of two completely deterministic causal pathways that cross in space and time leading to an unpredictable accident (and a bump on my head). Likewise, statisticians and other researchers often use random numbers to solve a variety of problems. In most cases, these random numbers (technically referred to as pseudo-random numbers) are generated by deterministic computer algorithms. Yet by all of our best standards, the numbers generated by these computer programs meet the test of completely unpredictable, random numbers (if one "starts" at a random point in the sequence.)

There are many other examples of deterministic systems that are so complex that subtle changes in inputs lead to unpredictable outcomes from the system. Such phenomena are explained by *chaos theory*. (One of the best sources on chaos theory is the book by James Gleick, "Chaos: Making a New Science," New York: Penguin, 1988.) The planetary climate has been used as one of the best examples of chaos theory. Climate scientists suggest that underlying our planet's climate is a set of deterministic equations. However, the climate is notoriously difficult to predict; very small changes in inputs lead to completely unpredictable outputs. This has led to the oft cited example of the "butterfly effect;" consider a butterfly flapping its wings in the Indian Ocean which, in turn, causes a hurricane in the Gulf of Mexico three months later. One of the great minds in the science and religion dialogue who has written a great deal about chaos theory and theology is the Rev. Dr. John Polkinghorne.

**Why do we start a game with a coin toss?**

The most obvious answer to this question is that it ensures an equal chance that each team gets the opportunity to begin the game in a manner of their choosing (e.g., kick off and receive the ball at the beginning of the second half, receive the ball to open the game, etc.); that is, the coin toss gives some objective guarantee of fairness. However, there is a second advantage that may not be quite as apparent. Over the long haul, that is over several seasons, your favorite team should win roughly half of the opening tosses and lose about half of them. So not only does the coin toss make certain that fairness is applied to this particular game but also to the long term process of determining how often teams win the choice of how to start games.

**Human uses of chance**

We just spoke of one way we humans use chance, to ensure fairness in games. However, there are many other ways we use chance or randomness to achieve our purposes. Games would not be nearly as fun if they relied strictly on chance or strictly on skill. Many children's games combine a certain amount of skill with a randomization device (say a die or a spinner) to make it possible for even a child to beat an adult if "luck" goes their way. Mathematicians and statisticians use pseudorandom numbers generated by a computer to study problems that may be intractable using standard axioms and theorems. So-called Monte Carlo methods enable researchers to approximate a correct answer with a high degree of precision using these chance processes. The use of chance in a new field known as random chemistry enables scientists to discover potential new drugs more efficiently than the standard theoretical methods. Any time election season approaches (well, in fact, pretty much year round anymore) we are presented with a multitude of poll results. These surveys use randomly selected samples from some larger population to give us an idea of the current thinking of the electorate and they do so with remarkable accuracy. In 1787 Mozart composed 176 bars of music for use in a musical composition dice game. His intent was to compose new 32-bar pieces of music by randomly selecting them from the larger pool using dice. The website [http://sunsite.univie.ac.at/Mozart/dice](http://sunsite.univie.ac.at/Mozart/dice/) gives a fascinating description of Mozart's thinking and the opportunity to randomly compose (and listen to) your own 32-bar masterpiece. If you ever saw the movie, *A Beautiful Mind*, about John Nash, Nobel laureate and developer of game theory you've seen another application of random processes used to achieve a purpose. Game theory is widely (and very successfully) used to solve a great many strategic decision making problems. And finally, the lowly spray painter uses the random distribution of tiny drops of paint on a surface to provide faster and more even coverage than using a paint brush. The bottom line is that we use random processes to solve many practical problems and achieve many desirable purposes.

**Might God use chance to achieve a purpose?**

After all, we are created in God's image...

Leonard Hodgson was Regius Professor of Divinity at Christ Church College at the University of Oxford in the mid-twentieth century. He was one of the first contemporary theologians to consider the possibility that God might use chance or random processes to achieve purposes.

**Some possible Christian responses: Open theism**

So, how might Christians respond to the randomness that we see all around us in creation. We will consider briefly four alternative views. The first of these is known as *open theism*. Open theism has been proposed by a group of evangelical Christians and remains controversial. In it God is seen as existing within time and space (as opposed to the traditional view that God exists outside of time and space - we'll consider the traditional theological response to chance later). As such, God can only know what is logically knowable. Whereas He may have deep insight into my inclinations, until I decide whether to have coffee or tea with my dessert God does not know what my decision will be. Therefore chance is a fundamental element in creation and the outcomes of chance or random processes are unknowable even to God.

Clark Pinnock has been one of the more out-spoken proponents of open theism among contemporary evangelical theologians. Leonard Hodgson and David Bartholomew, a contemporary British statistician who has written extensively on God and chance, could also be characterized as open theists.

**Some possible Christian responses: Simple foreknowledge**

Simple foreknowledge is a traditional view of God that argues that God, from eternity, knows all that will ever happen in the history of creation. So, whereas chance may be real and a creation of God, He sees everything including the outcomes of all chance processes from the beginning of time. Critics argue that this makes human free will an illusion as well as "tying God's hands" by His own creative act.

**Some possible Christian responses: Molinism**

Molinism is named after the 16th century Jesuit theologian Luis de Molina. Molinism is an attempt to reconcile God's providence with human free will and teaches that God knows all happens or will happen but also what humans will freely do in any possible circumstance. Molinists suggest that free will is saved and chance in creation is acknowledge at face value and that God's complete control of creation is maintained through His thorough knowledge of every contingency. Alvin Plantinga and William Lane Craig are two prominent proponents of Molinism.

**Some possible Christian responses: Classical theology (Aquinas)**

In this traditional view God is seen as existing outside of time and space and chance, or randomness, is part of God's creation. Chance is usually defined as, "the intersection of two or more lines of causality that are independent of each other, in a way that is accidental and unintended by the agents involved" (Baglow, cited earlier in the slides). In other words, chance is simply a function of our ignorance of causes. As such, God is the author of the "play" of creation. Just as a playwright is the primary cause of all that occurs in her creation, the play, the characters within that play act on one another and on the world around them as secondary causes. Clearly, the playwright is the ultimate cause. Therefore, God has created some things to necessarily happen the way He wills (think of the law of gravity, for example) and other things to happen contingently (as in there being a greater likelihood that I will choose coffee over tea to accompany my dessert). Still, God as the playwright authors the endpoint, or purpose, of creation. The greatest proponent of this traditional view would be the 13th century philosopher and Dominican theologian, Thomas Aquinas.

**Discussions questions**

No doubt you can think of many additional questions for discussion. More likely is that those hearing the presentation will actively engage the topic by raising questions of their own.

 Does chance in creation deny divine Providence?

 Is chance is a threat to God’s sovereignty?

 If chance exists, must there be no purpose to creation?

 Does chance eliminate the need for God?

 What would a world without chance look like?