

# Causality, Chance, and Connections

28 March 2019

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This essay introduces a topic I have been thinking about for a number of years. It also may allow me to connect the math impulse to a wider range of thoughts than just those based on math or even science. It all begins with the perennial question of “why” that infects us from childhood on. For most of us we tend to push the question into the background as we get answers to the most fundamental issues and acquire the basic emotional and mental abilities to cope with our existence.

But the urge is never entirely absent, however, and surfaces when confronted with “mysteries”. Many of them are sensational (or possibly specious), such as the Bermuda Triangle, Atlantis, UFOs, and Aliens. Some have stronger foundations, such as what caused the dinosaurs to suddenly vanish (a meteor)? or how did the Polynesians learn to navigate across the Pacific? or is the ancient Antikythera mechanism really a clockwork orrery and if so, how is that possible? And then there are the big ones, such as what is the origin of life? what is consciousness? There are more personal mysteries, such as what is our family origin story (genealogy) or the historical origins of our nation, or of other nations.

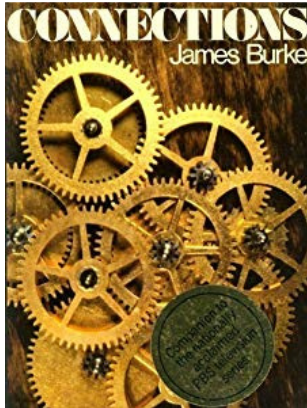
The big problem with any of these quests to find out information is how do we know if what we find is true? As I discussed in my essay, “Meditation on ‘Is’ in Mathematics Part II – Mathematical Reality,” the word “true” may be too strong a term. Perhaps the word “valid” might be better, though it often is a synonym. It conveys the idea that there is sufficient evidence to support the result—all of which sounds like a judgment call, which it is. I have avoided the word “believe” since we have numerous examples of people who believe things that are demonstrably false, a situation termed “cognitive dissonance.” Here is where mathematics offers comfort, if not general relevance, in that it has established rules for what it claims is true and false. But even there difficulties can arise in situations that get labeled “paradoxes,” namely those instances like Zeno’s Paradoxes that seem to assert things we know from experience are not true. So far, all these situations have been resolved by either modifying the mathematics or modifying the interpretation.

To explore the mathematics paradigm a little further, in contrast with so many other types of investigations, mathematics still provides the most secure form of validation through its system of reasoning. As I have mentioned often, plane geometry offers one of the most accessible areas for someone to experience this security in thinking. And Catriona Shearer’s geometry puzzles are the best example I have found for a novice with the barest memory of high school geometry to experience this first hand. With practically a 2000 year history of monopolizing “theoretical” mathematics until the advent of symbolic algebra by the 17<sup>th</sup> century and the usurpation of plane geometry by analytic geometry, plane geometry produced some highly sophisticated results. Kepler and Newton were virtuosi in deploying these advanced theorems. But Catriona Shearer’s deft and elegant problems rely on none of these abstruse results. Their power is in their simple and accessible solutions which are nevertheless hidden at first encounter. It is the pleasure of personally uncovering these secrets that makes her problems so satisfying and so revealing of the true nature of mathematics, which can be available to anyone.

Humans really like to solve puzzles and love mysteries, whether in fiction or reality. So we are constantly seeking explanations for things. As I mentioned in my “Angular Momentum” essay, explanations in physics originally involved physical cause-and-effect (causal) relationships that in modern times seem to have been replaced by mathematical logical arguments (chains of if-then statements).

In historical research the same search for causes dominates the effort. But what adds special spice to the historical explanations is the seeming intervention of chance. Yes, the chance event

becomes a cause, but it often disrupts an argument based on the actions and decisions of individuals. For example, the Japanese term *kamikaze* (divine wind) “has been used since August 1281 to refer to the major typhoons that dispersed Mongol-Koryo fleets who invaded Japan under Kublai Khan in 1274,”<sup>1</sup> signifying the intervention of chance to change the direction of Japanese history. Examples can be multiplied indefinitely and provide one of the more fascinating and entertaining aspects of historical research. In fact, I may rehash the amazing story of Columbus and his “discovery,” though by now I imagine everyone is familiar with all the mistakes and false stories associated with the event. (It was still unknown in 1977, however, when my son attended second grade and brought home his lesson that Columbus proved the earth was not flat.)



But there are other historical linkages whose interest stems not from chance but from their improbability or surprise. For example, there is Thor Heyerdahl’s exploration of the connection of reed boats in Lake Titicaca to those in ancient Egypt. If a causal connection is valid, then the consequences for early intercontinental communication are fascinating. Many other surprising associations have prompted thoughts of previously unknown interactions or relationships. James Burke produced several TV programs and a book back in the late 1970s that developed this idea under the title of *Connections*. I was enthralled with his rapid-fire romp through history linking the most disparate-seeming events into a chain of connections that led to some modern technology. One link I recall was the cross-fertilization of breweries with ship-building when the builders, plagued with constantly having to remove barnacles from their wooden hulls, got the idea from breweries, which used copper vats for their beverage, to cover the hulls with copper that discouraged the barnacles.

But as the series wore on I began to find the “connections” drifting from ostensible causally-related events to mere “associations” that were not supported by any evident link. I soon lost interest. I had seen before where “associations” had been misused to create supposed causal links in such early works as Von Däniken’s *Chariots of the Gods?*, which, though immensely fascinating, proved to be a stretch. I can’t remember if it was in Von Däniken’s book or somewhere else that I saw the depiction of a Mayan god who they said was “clearly” being shown as an alien pilot of a space ship—just because it *looked like* a space ship to modern eyes, it must *be* a space ship. (I see from *Wikipedia*, that the “god” was actually the Mayan ruler Pakal in the 7<sup>th</sup> century AD, as the figure at right shows.<sup>2</sup>) This confirmation by *Wikipedia* illustrates a huge change from the situation of my day, in which “mysteries” often persisted because there were insufficient resources available to check the veracity of the solutions. Now, at least, *Wikipedia* seems to offer an opinion on about any subject. Of course, the issue of how true it is still persists and requires diligent further research and the application of accepted standards of evidence to confirm the information.



Tomb Lid of Pakal

Though I am disparaging the unfettered “associations” that people posit as evidence of causal relationships, there still are legitimate discoveries that demonstrate true connections with all their

<sup>1</sup> *Wikipedia* (<https://en.wikipedia.org/wiki/Kamikaze>)

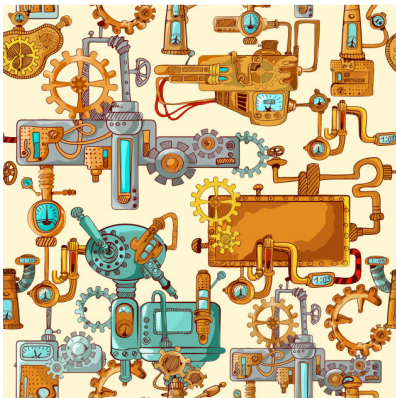
<sup>2</sup> *Wikipedia* (<https://i.pinimg.com/originals/fc/bb/fa/fcbbfada921be4d20f6cf54158c46d05.jpg>)

implications. For example, the current spring 2019 *Lapham's Quarterly* devotes its issue to trade and has a list of objects found by archaeology that suggest there were many long-distance ancient trade-routes. One instance is an ivory statuette that came from Bhokardan, more than 250 miles east of Mumbai (Bombay), India, which was found in Pompeii, destroyed in 79 AD.

This Greek-Indian link recalls my astonishment when in the mid-1960s I saw a brief reference in an Oriental art book (which I can no longer locate) regarding statues of the Buddha that appeared in Gandhara, an early Indian region on its northwestern frontier reaching into present-day Afghanistan. (I later learned this is about the same area and time where the massive Bamyán Buddha statues were carved out of cliffs in the 6<sup>th</sup> century AD and were then horrifically destroyed in the 21<sup>st</sup> century by teenage Taliban vandals.) The startling thing about this 1960s' reference was that it said the statues were due to Greek influence, as proved by the curly hair (Asian hair is generally straight) and characteristic Greek draping of the folds of the garment the Buddha was wearing. But in the pre-*Wikipedia* era I searched in vain for an explanation. A decade later I came across a book by Michael Edwardes<sup>3</sup> that provided more significant information, which cried out for more extensive corroboration, but none could be found. It was three more decades until I finally hit pay-dirt with the voluminous information provided in a set of 2007 *Wikipedia* articles. Even though the story is now available to anyone, I still might want to write about it, since it links up with some other pet inquiries of mine.



174ft Buddha of Bamyán before 2001.  
*Wikipedia*



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Finally, there is a philosophical dimension to this urge to explain and search for causes. I have addressed it a bit in my discussions of the invasion of physical causal explanations by abstract, imagined mathematical chains of reasoning. Over the centuries the human mind has produced a panoply of theories and models for how things are linked and connected. Meta inquiries raise the question as to whether these efforts describe reality or are just another form of creative art. My favorite author, Jorge Luis Borges, has written numerous essays and stories playing with the issue. One of his favorite pastimes is to link across time certain metaphors or ideas expressed by unsuspecting philosophers and thinkers who show no evidence of being aware of the linkage themselves, but share in the common endeavor to understand.

One reason for introducing this topic of Causality, Chance, and Connections is so I can write about Borges. So be warned.

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<sup>3</sup> *East-West Passage: The Travel of Ideas, Arts and Inventions between Asia and the Western World*, Taplinger Pub. Co., New York, 1971