# A Random Universe

By Richard G. Colling.

A Christian biology professor uses randomness to unite evolution and creation.

William Bragg was an acclaimed English physicist who received the Nobel Prize in 1915 for advancing the use of X-rays to study crystalline structures. Just a few decades later, similar X-ray studies were key to deciphering the molecular structure of DNA. Bragg, known as a brilliant, humble man, once commented, "The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them." The same might be said of religion.

In religion, there are many counterintuitive statements: The last shall be first. It is better to give than to receive. The greatest among you must be a servant. Death leads to life. Yet in spite of the apparent incongruity of such statements, at a deeper level they speak eternal truths that motivate and inspire people of all faiths. Here I describe another counterintuitive idea that is expanding my view of the world and God - random design, or the idea that God created the universe through random events.

The concept of random design may raise a few eyebrows. After all, in a world that values rules, organization, structure, and order; where science speaks of laws; and where theological authority equates God with order and Satan with disorder, it may be difficult to appreciate physical laws that embody an element of randomness. Nevertheless, randomness really does govern our lives in many ways.

For example, was it by design or chance that one randomly swimming sperm cell collided with your mother's egg to become you? Taking into account the genetic processes involved in reproduction, the odds of producing another individual exactly like you - even from the same parents - are easily greater than one in 70 trillion.

Or consider the millions of specialized biochemical reactions taking place within each of our 100 trillion cells at this very moment. Fundamentally, and in unexpected ways, it is randomness that drives these chemical reactions and imparts to these cells the most remarkable physical characteristics of all - the characteristics of life.

Finally, no discussion of randomness is complete without including evolution - that thoroughly messy, often brutal, inefficient, yet remarkably effective creative process that has nurtured the development of all life on Earth for eons.

No doubt, the marriage of randomness and design faces language and cultural hurdles, and will take time to appropriately define. Scientists, for example, sometimes find it difficult to distinguish between random and near random events. And it does not help clarify matters or promote peace and understanding when religious people and atheists alike speak of the godless nature of randomness. Consequently, many people view the word "random" negatively. Nevertheless, a growing number of people are beginning to

recognize that the word "random" can also convey a more positive and constructive meaning: equal probability of occurrence. In this light, random design is an equal-opportunity process, and God an equal-opportunity creator.

The exquisite elegance of random design resides in both its underlying simplicity and versatility. From the formation of the heavens to the development of life itself, all available possibilities are tested. Thus, in the most unexpected ways, random design endows the entire created order with boundless, life-giving promise.

### Design keeps going

Random design has two components that can act singularly or in concert: an energizer to keep things humming and a combinatorial mixer to continuously stir the pot and create new opportunities.

The energizer driving random design is well-known to most scientists as the uniform tendency of all physical and chemical reactions to move toward disorder. While once again seemingly counterintuitive, this tendency toward disorder is actually *crucial* to the creation of order, imparting to our world an essential directionality. Indeed, without this directionality, nothing in the world would happen. No chemical reactions, no physics, no connections, no movement, no life - nothing. Thus, in a surprising and provocative twist of irony, nature's rush to disorder and randomness is actually the key ingredient enabling life.

The second component of random design is the combinatorial mixer. The mixer's job is to generate vast repertoires of building blocks from which higher order and structure can be assembled. In biology, the mixer accomplishes this task via combinatorial mathematics. By randomly shuffling DNA sequences, vast arrays of unique combinations are created - the raw material fueling random design. Those combinations best suited for a particular function are then sequentially selected and incorporated into an ever-expanding architectural design.

### A higher order

Because random design plays such vital roles for life, it comes as no surprise that advanced life forms have developed elaborate mechanisms to create, maintain, and even extend random processes. The beauty of this approach is that seemingly separate random processes become significant constituents of a larger systematized and coordinated organizational hierarchy. In fact, in some of these life systems, organized and deliberate randomness actually becomes a primary goal to accomplish higher purposes.

An example of such higher-order random design is seen in the billions of cells of the human immune system. Each of these immune cells, or lymphocytes, provides an essential and specific defense against one of the millions of potentially harmful invaders we might encounter during our lifetimes. But given that only a handful of our nearly 23,000 genes are devoted to immune defenses, how do these cells successfully

accomplish such a remarkable feat? Randomness to the rescue: Unordered chance variations in a few specialized immunity genes occur within each cell during its development in the bone marrow. The result is a continuously replenishing repertoire of specifically targeted lymphocytes which working together, afford us preemptive protection against virtually all infections agents - even those that do not yet exist! In this way, apparently random processes lead to astonishingly purposeful outcomes, making our survival possible.

## Taking the reins

The extraordinary potential of random design has not escaped the attention of modern science. Researchers from a variety of fields, such as biotechnology, medicine and communications, are keenly aware of its power, and are learning to corral and leverage its creative powers.

Biochemists simulate evolution in a test tube to uncover new therapies for disease. In just weeks, scientists can create massive random combinatorial libraries of short sequences of RNA or DNA. The resulting trillions of differently shaped molecular compounds, called aptamers, are then screened for their ability to influence the cell's activities by binding with critical cell signaling molecules. Because an astonishing diversity of molecular shapes exists within the total aptamer pool, it is possible to create and select aptamers against virtually any molecular target. The potential applications are stunning: Aptamers are being evaluated to diagnose and treat several human diseases such as cancer, AIDS, eye diseases, multiple sclerosis and epilepsy.

Randomness is also being used in applications such as cellular communications, data encryption and airborne radar. Random background noise serves as a masking medium in which meaningful messages are embedded. Those individuals who are privy to the code can successfully identify and extract the significant information from the noise.

Artificial intelligence studies show that computer machine learning appears to be more intelligent if the intelligent agent randomly tries various alternatives and then learns by adjusting future behavior to positive or negative feedback - an example of good old-fashioned trial and error, basically identical to the way toddlers learn to negotiate their worlds.

Finally, geneticists, when doing genetic engineering, understand that the random statistical nature of DNA incorporation into recipient cells makes the process extremely inefficient. Consequently, millions of cells and far greater numbers of gene copies must be mixed together to successfully insert a favorable trait into even one of these cells. Yet amazingly, successfully transforming just one cell is sufficient. Just as observed in evolution, once a genetic change has occurred, it becomes permanently ingrained in the DNA of all succeeding generations of this cell. Indeed, virtually all genetically modified crops and animals in existence today began with just one such special cell in a laboratory - a singular product of random events, yet truly unique and possessing exquisite value.

#### Building credible bridges between science and faith

Random design does not invoke new scientific laws or processes. It simply provides a credible way to embrace the empirical realities of the modern scientific world while also affirming traditional faith claims regarding the existence of a creator. In this very specific sense, random design resembles intelligent design. However, the striking and liberating distinction is the greatly extended role for intelligence. Intelligent design inserts God into perceived gaps in scientific understanding with the goal of repudiating evolution. These 'God of the gaps' insertions populate natural history like lonely stars in the sky - tiny lights against a great backdrop of darkness. Random design, by contrast, lights up the entire sky with intelligence, ascribing the entire creative process - even the randomness - to a purposeful, coherent creator. In addition, random design is attractive because it recognizes science must be free, not subject to religious veto. Random design grants this freedom, refusing to redefine or compromise the integrity of science to meet religious standards. It affirms and liberates science to pursue truth in the physical and biological domain wherever it leads.

People of faith can wholeheartedly embrace random design. Random design is ecumenical, offering a larger, more expansive vision of God - a God who fashions the laws of randomness for a divine purpose, to create and draw the created to the creator.

Random design also strengthens and enhances the credibility of faith and spirituality because it enthusiastically embraces all verifiable physical and biological discoveries from science. The truth is that facts never negate faith, and genuine faith never attempts to negate facts.

Perhaps the most important immediate contribution of random design is in public science education arena. Random design provides a comprehensive remedy to the science - faith public education controversy, granting each side in the discussion exactly what they claim to want and everything either group can reasonably expect: Science is free; God's place is secure.

It has been said that the highest intelligence always involves a bit of mystery and paradox. This is why random design is a perfect fit: *The destructive laws of randomness are the very same laws that fuel creation!* Science clearly demonstrates that randomness plays pivotal roles in bringing about physical and biological order in our world. Therefore, maybe it is time to cast off worn and discredited concepts of creation, exchanging them for a new vision that acknowledges and celebrates randomness as a part of a comprehensive and purposeful plan.

Human beings now mimic a multibillion-year biological process to create drugs for human diseases; communicate across the globe and beyond though thin air with cryptic codes embedded deep within random cosmic noise; fine-tune genes to modify life; and construct machines whose ultimate design test is whether their learning and actions reflect the mind of their creator. We have to wonder: Maybe the highest intelligence truly is one that purposefully harnesses randomness. Maybe we are coming full circle and beginning to more fully reflect the essence of the creator within us. Random design has the potential to shape an age by acknowledging that much of what appears random is actually bursting with purpose and meaning.

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