

It may be that the authors were thinking along the lines of the Westminster Confession where in the second section of the fifth chapter we read: "Although in relation to the foreknowledge and decree of God, the first cause, all things come to pass immutably and infallibly, yet by the same providence he ordereth them to fall out, according to the nature of the second causes, either necessarily, freely, or contingently." If so, it would have been helpful had they made that explicit. However, I suspect they might have been thinking more along the lines laid out by Peter Zoeller-Greer in his March 2000 article, "Genesis, Quantum Physics and Reality" (*PSCF* 52, no. 1, pp. 8–17). Again, it would be interesting to know.

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## Divine Sovereignty, Chance and Design: A Response to Carter

We are delighted that our article (*PSCF* 55, no. 3 [September 2003]: 175–84) has elicited further discussion of the role of randomness in Christian theology and we hope this continues. In response to Carter's first point, we wonder what evidence he has that "a predetermined result [by God] is not an expression of chance [from our vantage point]." This statement appears to us to have the earmarks of an unsupportable faith statement. Consider the situation if we flip a series of coins, observe the outcome, but do not tell you what the sequence is. Then, we ask you to guess the sequence one by one. From our perspective the coin tosses are predetermined, but for you, it appears random. We are making no claim that God needs to flip a coin to make decisions that appear to us to be random ones. We suspect that he does not, but we have no way of knowing one way or the other. We recognize that Christians have a difficult time accepting that what appears random to us can actually be fully within the scope of a sovereign God, but one of the points of the paper is to encourage Christians to get over this conceptual difficulty. We think the interpretation we have given to random-appearing events described in the Bible is a reasonable one, which in no way robs God of his sovereignty. Moreover, as we have explained in some detail, it squares well with what has been observed in DNA sequences.

We think it unwise for Christians to draw a line in the sand and insist that an appearance of randomness to humans is evidence to support an atheistic viewpoint—and therefore must be resisted at all cost. Of course, non-Christians are just as vulnerable as Christians are to fall into this trap. There is no justifiable reason for Christians to expect better of non-Christians. But Christians, who have properly digested the message of God to Job, should be able to accept, with humility and due reverence to their Creator, the huge gap between God's perspective and ours. Rather than argue with the non-Christian that what clearly appears random is not, we should agree with them that it really does appear random, and then point to the scriptural references (cited in our original article), which shows that God is still God.

Concerning the second point about lowering the bar for the detection of design, we do not feel that it is lowered. Just as with randomness, which cannot be proven, neither can design be proven. When an entire group of people is engaged in trying to prove the demonstrably unprovable, the assessment, "a waste of time," comes to mind. We must remember that Christianity is a faith, not a proof.

Finally, as to what "lines" we were thinking along, we were merely incorporating what we were seeing in the statistical structure of DNA into what we view as the best theological approach, given the observational data. Since we wrote this article for *PSCF*, we have encountered even more compelling evidence of randomness in DNA data, including human DNA data. Anyone who is interested may request an electronic copy of the manuscript "Global Markov Models for Eukaryote Base Data."

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## What Is Randomness?

Randomness is a phenomenon very hard to verify. Statistical tests are used to test for randomness. Every statistical test is based on a null hypothesis (e.g., randomness) and a probability model associated with the null hypothesis. The test statistic is a condensation or summarization of data (e.g., a measure of randomness), and it has sampling distributions under the assumed probability model. The test statistic obtained from the data with its numerical value is compared with this sampling distribution. If the value is too extreme, then one can reject the null hypothesis. If the value is not extreme, one can only conclude that the null hypothesis is not rejected, but not that the null hypothesis is established. The reasons are several: the sample size may not provide enough power to reject the null hypothesis, the particular test is not powerful against certain deviations from the null hypothesis, or there are other possible probability models associated with the null hypothesis. Usually one could not conclude randomness just by a single test or measure. However, Morton and Simons (*PSCF* 55 [2003]: 175–84) used only one measure, the length of string, to carry out statistical tests. Their tests are examples of tests based on the total number of runs (See Jean D. Gibbons and S. Chakraborti, *Nonparametric Statistical Inference*, 3rd ed. [New York: Marcel Dekker, 1992], 68–93). There are other aspects and measures in the chromosomal structure that are worthwhile investigating (See Bruce S. Weir, *Genetic Data Analysis II: Methods for Discrete Population Genetic Data* [Sunderland, MA: Sinauer Associates, 1996], 291–340).

From Figure 1 (p. 179 in the Morton and Simons article), the total number of genes is 512, which is different from 522, the number given in the first row of Table 1 (p. 180). [*Managing Editor's note*: There is a typesetting mistake in Figure 1. In row Strings 61–80, the number in the tenth col-

umn should read 12, not 2.] The test provided (Model 1) has two components: one is for  $p = 0.5$  and the other for randomness in arrangement. When the test statistic has extreme value, it could be due to deviation in either component or both. It will be useful to separate the test into these two components and find out what is the reason for deviation. It seems that there is no *a priori* reason why  $p$  should be 0.5; the deviation from  $p = 0.5$  should not be viewed as against randomness. After decomposing the test, more insights could be gained. From the results given in the paper one can only make a limited conclusion that, regarding the length of strings and under the probability models considered, more randomness is found in more complex eukaryotes.

Even if a collection of data can pass many tests of randomness, it may not warrant the conclusion that the data are random. For example, the random numbers generated by computer are called pseudo-random numbers because they are not truly random. They could pass many tests of randomness, but they are generated by a deterministic algorithm. When one knows the seed number and the detailed algorithm, the data sequence is entirely predictable. The same is true for some chaotic patterns. They are generated by some deterministic means, which could be repeated under the identical initial conditions. Therefore, appearance of unpredictability is compatible with algorithmic determinism. Some choose to differentiate between unpredictability and randomness.

Randomness can only be evaluated in a population scale (Dembski distinguishes between randomness and chance). All of the statistical tests depend on sufficient amount of data. Even if a collection of data is random (passes all tests of randomness), that does not imply that an individual data point is necessarily random. Therefore, population randomness is compatible with individual determinism. That could be the basis of statements in Prov. 16:33 and Rom. 8:28. That also provides justification of applying probability theory and statistical models for the investigation of natural and human phenomena. For all practical purposes, the probability theory and statistical models provide good approximations or descriptions of some population phenomena. Florence Nightingale was quoted in saying: "To understand God's thoughts we must study statistics, for these are the measure of his purpose."

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## Can Inanimate Objects Exercise Rationality?

The shortcoming I see in the article "Faith and the Human Genome" by Francis Collins (*PSCF* 55, no. 3 [September 2003]: 142-53) is just about as fundamental as a shortcoming can be. Collins asks inanimate objects to exercise rational judgment. Yes, it is "amazing to contemplate the elegance of DNA carrying information." But it is even more than amazing to go one more step and to contemplate how inert materials know how and when to do what needs to be done if a process is to proceed as required.

The author is certainly not alone in saying that clumps of inanimate atoms are "able to direct all of the biological properties in a human being." In fact, I am made to feel like a very lone voice in the vastest of wildernesses when I argue that articles such as this one only describe the prosaic, the superficial features of biological events and circumstances. As such, the resources that are inherent in the pursuit of science give way to other human endeavors that are willing to answer the public's urge to know what it really means to be alive.

This is why I have tried to encourage science teachers to explore with their students the possibility that life is an entity in itself, something beyond the realm of familiar chemical and physical kinetics. Something every bit as real as energy, equally impossible to experience apart from interaction with matter, equally impossible to destroy and improbable to create anew, equally infinite in time and space. Yes, I realize that I am challenging the mindset of our most honored scientists. However, to me, there is no other way to address the discrepancy between the paltry dimensions of the physical-chemical concept of life and the actual magnitude of whatever it is that tells us a newborn is breathing, a kernel of wheat may germinate, an anthrax spore is infectious, a giant redwood will stay green, or a stem cell will show differentiation.

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