

# Sanford's Genomic Degeneration Theorem

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**Theorem:** *"When subjected only to natural forces, the human genome must irrevocably degenerate over time."*<sup>1</sup>

**Definition:** *"A genome is an instruction manual that specifies a particular form of life."*<sup>2</sup>

All conclusions depend on presuppositions. All science is organized knowledge. The most efficient way to see the depth of science in a proposed scientific theory is to first represent the theory in terms of an irreducible set of indisputable axioms and to then note the sophistication of the logical reasoning that takes us from the axioms to the logically derived conclusions.

The joy of mathematics is in recognizing the beauty and power of a clever argument. There is a lot of beauty in Sanford's genomic degeneration theorem. Unquestionably, Sanford obscured his central argument with an overly complicated 200 page book. It is easy to understand why Sanford devoted so much of his important book to discussing favorable albeit weakly related peer-reviewed research. Dr. Sanford is a geneticist. He has engaged in genetic research as a Cornell professor for almost three decades, holds over 30 patents, and has published over 80 scientific publications in peer-reviewed journals.<sup>3</sup>

Since you are all mathematicians, you're more interested in the substance and logic of Dr. Sanford's arguments. So I will share the quintessence of his book with you today. Dr. Sanford's key argument, which is thematically related to the heat death of the universe, is essentially this:

1. DNA, which is found in every cell, determines the information available for building and maintaining an organism. DNA is the hereditary material in all living things that is passed on to descendants.
2. DNA—an extraordinarily long molecule, which encodes a fantastic amount of information—is "a linear sequence of four types of extremely small molecules, called nucleotides. These small molecules make up the individual steps of the spiral-staircase structure of DNA. These molecules are the letters of the genetic code, and are shown symbolically as A, T, C, and G. These letters are strung together like a linear text. They are not just symbolically shown as letters, they are very literally the *letters* of our instruction manual."<sup>4</sup>
3. The DNA copying process is imperfect; there are random, frequently occurring single-character misspellings, deletions, insertions, duplications, translocations and inversions.<sup>5</sup>
4. The number of DNA copying errors has been measured to be between 100 and 200 per person per generation.<sup>6</sup>

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<sup>1</sup> Dr. J.C. Sanford, *Genetic Entropy and the Mystery of the Genome* (Classroom Edition), p. xii.

<sup>2</sup> *ibid*, p. 1.

<sup>3</sup> <http://www.amazon.com/Genetic-Entropy-Mystery-Genome-Classroom/dp/0981631614>

<sup>4</sup> *ibid*, p. 2.

<sup>5</sup> *ibid*, pp. 6-8, 19, 34-37.

5. Whenever information or code is expressed in the alphabet of any language, successive random copying errors of that code will inevitably destroy the information beyond useful functionality after a limited number of iterations.<sup>7</sup> We take this axiom as being inescapably true as a universal principle. It is then certainly applicable in every conceivable special case such as the information in anything resembling a book, a computer code or DNA. Consequently, the number of pages that might be devoted to an exhaustive but irrelevant index and glossary, and any computer code that might have embedded within it a huge number of comments unreadable by computers, (which are routinely inserted by programmers as indispensable documentation for other programmers that might take up the task of modifying the software in the future), and the possibility of junk DNA, which is defined to be DNA segments that have no discernible purpose, changes nothing.

All of Sanford's axioms are testable. And the inescapable conclusion of these five axioms should be readily transparent. All life — and the human race in particular — is doomed to extinction.<sup>8</sup> However, if you're not persuaded by the argument and believe that natural selection, "the Primary Axiom of biology," somehow circumvents the genomic degeneration theorem, then I must point you to chapter 4 of Sanford's book: "**All-Powerful Selection to the Rescue?**" I believe this chapter presents a very challenging thought experiment:

Let's imagine a new method for improving textbooks. Start with a high school biochemistry textbook and say it is equivalent to a simple bacterial genome. Let's now begin introducing random misspellings, duplications, and deletions. Each student, across the whole country, will get a slightly different textbook, each containing its own set of random errors (approximately 100 new errors per text). At the end of the year, we will test all the students, and we will only save the textbooks from the students with the best 100 scores. Those texts will be used for the next round of copying, which will introduce new "errors", etc. Can we expect to see a steady improvement of textbooks? Will we expect to see a steady improvement of average student grades?

Most of us can see that in the above example, essentially **none** of the misspellings in the textbook will be beneficial. More importantly, there will be no meaningful correlation between the subtle differences in the textbooks and a student's grade. Because every textbook is approximately equally flawed, and the differences between texts are too subtle to be significant... a student's grade will be determined by many other important variables, including different personal abilities and different personal situations (teachers, classrooms, other kids, motivation, home life, romantic life, lack of sleep, "bad luck", etc.). All these other factors (which I will call *noise*) will override the effect of a few misspellings in the textbook. If the student gets a high grade on the test, it is not because his text had slightly fewer errors, but primarily for all those other diverse reasons.

What will happen if this mutation/selection cycle continues unabated? The texts *will* obviously degenerate over time, and average student scores will eventually also go down. Yet this absurd mutation/selection system is a very reasonable approximation of the Primary Axiom of biology. It will obviously fail to improve or even maintain grades for many reasons."<sup>9</sup>

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<sup>6</sup> <http://www.nature.com/news/2009/090827/full/news.2009.864.html>

<sup>7</sup> *ibid*, pp. 45, 136, 165, 166, 170, 188.

<sup>8</sup> *ibid*, pp. 72, 83, 116-117, 119, 144, 173.

<sup>9</sup> *ibid*, pp. 49-51.