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Does DNA = God? Bioinformatics and intelligent design

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Abstract: The science of bioinformatics is relatively new. It began in the 1960s as a way to handle the massive amount of data that was beginning to be revealed in DNA. One of the critical insights that researchers discovered was that DNA contained a treasure trove of information: the programming of life. It is the thesis of this article that the encoded information in DNA is not similar to a written human language: it is a language. Just as the information conveyed in languages comes from minds, so too must the instructions programmed into DNA.

Keywords: DNA; Intelligent design; Language; Information; Translation.

DNA = Deus? Bioinformática e design inteligente

Resumo: A ciência da bioinformática é relativamente nova. Teve início na década de 1960 como uma forma de lidar com a enorme quantidade de dados que começava a ser revelada no DNA. Um dos insights críticos que os pesquisadores descobriram foi que o DNA continha um tesouro de informações: a programação da vida. A tese deste artigo é que a informação codificada no DNA não é semelhante a uma linguagem humana escrita: é uma linguagem. Assim como as informações transmitidas em idiomas são originadas em mentes, as instruções programadas no DNA também devem ser.

Palavras-chave: DNA; Design inteligente; Linguagem; Informação; Tradução.

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Introduction

In 2009 philosopher of science Stephen Meyer (2010) introduced his book *Signature in the cell: DNA and the evidence for intelligent design*. In that groundbreaking work Meyer developed his concept of information as the missing element in the study of life's origin (MEYER, 2010, p. 1). Though material processes could theoretically account for the molecules that make up life's machinery, there is no known mechanism other than minds to account for this information. Atheist philosopher Thomas Nagel (2012, p. 118) notes,

> no viable account, even a purely speculative one, seems to be available of how a system as staggeringly functionally complex and information-rich as a self-reproducing cell, controlled by DNA, RNA, or some predecessor, could have arisen by chemical evolution alone from a dead environment (MEYER, 2010, p. 31-32).

The informational content of DNA is the prime example of Meyer's thesis that there is a mind behind the material.

Most scientifically knowledgeable people today are aware that DNA (Deoxyribonucleic Acid) is the molecule responsible for storing genetic information in living beings. The data stored there is responsible for the cell's growth, division, and the manufacturing of proteins (SCHLEIF, 1993, p. 2). Our understanding of how the molecule of life operates has grown over the years, but we don't know everything. For example, we don't understand how (or where) the body plan for the developing embryo is stored, nor do we comprehend how the various cell types (liver, brain, etc.) are encoded (TUSSCHER; HOGEWEG, 2011, p. 1-16).

The physical operation of DNA is still being investigated today, almost 70 years after Crick and Watson discovered the double-helix structure of the molecule (THAXTON; BRADLEY; OLSEN, 1992, 1). One area of research for which there is precious little research is the origin of the information in the first DNA molecule. Scientists have not determined the purpose of much of the DNA molecule's long chain. Even more telling, though the research on the origins of the molecules that direct the development and functioning of living beings continues afoot, there has not been progress towards a theory of the source of the information encoded in those molecules (RANA; ROSS, 2014, p. 137).

Physicist and information theorist Hubert Yockey (1992, p. 290) noted that "life is consistent with the laws of physics and chemistry but [is] not derivable from them."

In the popular skeptical community, the origin and development of DNA and its informational content are generally explained away with a combination of hand-waiving and an informal logical fallacy known as "an argument to the future." The fallacy "argument to the future" is one where "someday, evidence will be discovered to justify your conclusion" (BENNETT, 2012, p. 300). In the area of scientific reasoning, this delusion is characterized by blind faith that "someday science will find the answers." Science has made many remarkable discoveries, but the concept that science will learn all answers is neither logically necessary nor warranted by the evidence.

In his 2006 bestseller, *The God delusion*, popular skeptic Richard Dawkins (2016, p. 137-138) wrote that there were two choices for explaining how DNA or its hypothesized equivalent first arose:

1) God did it.

2) Life arose as a result of random forces.

Dawkins then estimated the odds of life forming on a random planet at one in a billion. With the growing number of extrasolar planets being discovered weekly, he believes that the odds favor life arising not only on Earth but on countless other worlds as well. "Once the vital ingredient–some kind of genetic molecule–is in place, true Darwinian natural selection can follow, and complex life emerges as the eventual consequence" (DAWKINS, 2016, p. 137).

Of course, no one knows the actual odds of life spontaneously generating anywhere. As physicist Paul Davies (*apud* Lewin, 2016) says, "We don't know the mechanism whereby nonlife turns into life, so we have no way of estimating the odds. […] It may be one in a trillion trillion (it's easy to imagine that), in which case, Earth life may be unique in the observable universe." The point of his statement is that it is impossible to calculate the odds of life in the universe when we know so little about life or the universe. If the odds of random chance working through natural forces are vanishingly small, is there another possibility? Of course there is, and Dawkins mentioned it as one of his two choices: God specially created the first life. This conclusion is not offered as a deductive proof but as an argument to the best explanation.

The follow-up question is what we will be pursuing here: Is there evidence that the biblical God had a hand in creating the first life? Breaking this question down into easier-to-access questions requires first stipulating what kind of God is the God of the Bible. For the purposes of this article, God will be defined as a timeless, spaceless, eternal, immaterial personal being of immense power and knowledge. By timeless, it is meant that the physical universe does not limit God; He exists beyond it. He created the universe; He is not a part of it. As a timeless being, God does not experience the passage of time. He exists outside of and independent of the restraints of time.

As a spaceless being, God is not limited by Space-Time. He is not a three-dimensional being; He is dimensionless. God exists in the same way that abstract objects exist, independent of space. God is simultaneously everywhere and in no particular place. Asking where God is, is like asking, "Where does 2 plus 2 equal 4?" Everywhere, but nowhere that we can point.

As God exists outside of time, He is eternal. He did not begin to exist because He exists timelessly. God does not need a creator because He is not created. Only finite, composite beings need a creator.

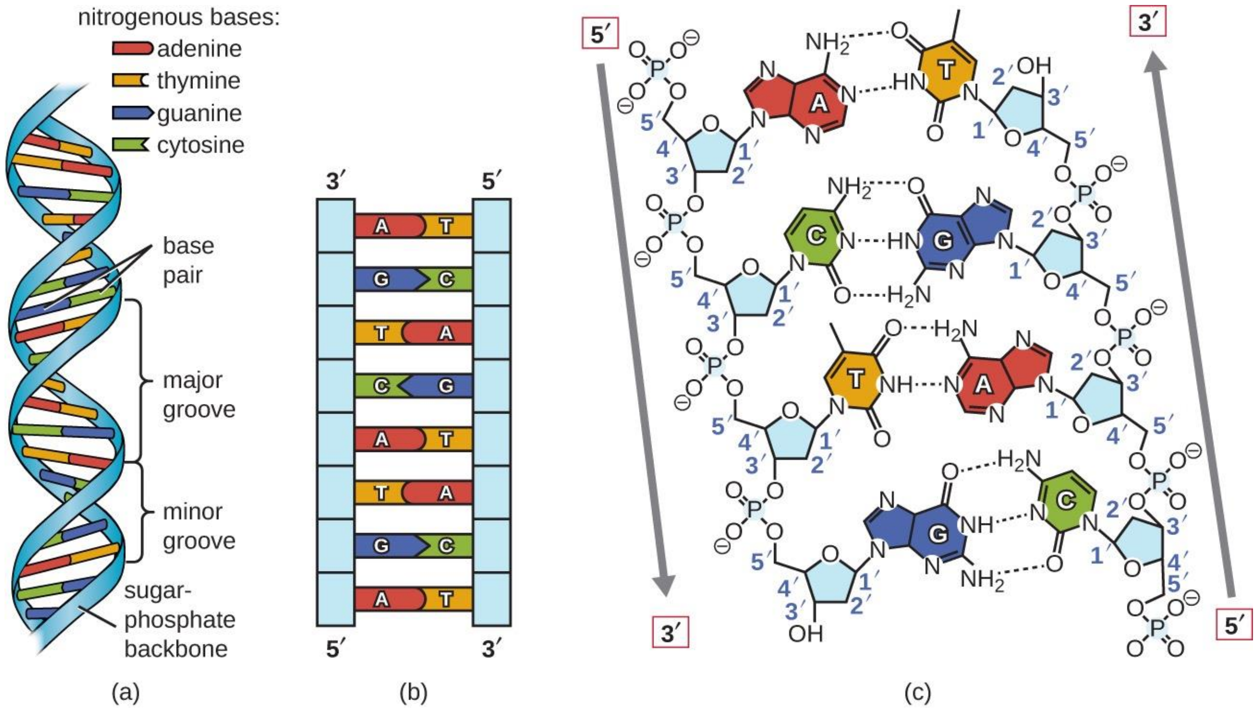
Since God is not physical, the key to seeing His hand in the creation of life is not to look for physical evidence but for the characteristic of life that is non-physical: information. The aspect of God's existence which will be surveyed here is His intelligence. We cannot directly measure God's intelligence, but we can infer that a being of immense knowledge and intelligence exists through examining the results of His actions. The ancient dictum is that an effect in some way resembles its cause. In the case of this study, we will look at the non-physical aspect of DNA, the information content, and show how the origin of that information is much more likely to have come from a mind which preexisted physical life.

What is DNA?

There are several possible, correct answers to the question "What is DNA?". The first response is that DNA is the most compact information storage system in existence. It far exceeds the storage capacity of any computer chip ever invented. It is orders of magnitude more efficient than any existing physical product of the human mind. It is the most efficient storage system ever created. Scientists have hypothesized that if the technology becomes sufficiently advanced, it could store 15 petabytes (215 million gigabytes) in a single gram of DNA (SERVICE, 2017). To go even further, one teaspoon of DNA could hold the design information of all species of life that have ever existed and still have room to encode every book that has ever been written (DENTON, 1997, p. 334). There is no human-constructed system even in the competition.

Another correct, more technical answer to "what is DNA?" is that it is Deoxyribonucleic Acid. The molecule of life consists of a sugar (Deoxyribose)-Phosphate backbone with nucleic acids forming the lattice-like structure of the double helix spiral.[2] The nucleic acids are Adenine, Thymine, Cytosine, and Guanine (ATCG). The nucleic acids carry the information necessary for all of life's development and functioning. Adenine always pairs with Thymine, and Cytosine always pairs with Guanine. A hydrogen bond conjoins these bases.

Figure 1 — DNA Structure



[2] The "Deoxy" portion of Deoxyribose indicates that the sugar ribose has lost an oxygen atom from a reduction reaction. It has been De-oxygenated.

The sugar-phosphate outer structure supports the base pairs of the nucleic acids. There is no chemically necessary reason for the order in which nucleic acids line up. This arrangement should make sense. That is because if there were a predetermined way in which the nucleic acids lined up, they could not carry information. The information in DNA, in that case, would only be a repeating pattern. Something akin to a book in which all that is written is "Green is good, green is good, green is good etc." An undeveloped sort of data would be carried in such a sequence, but it would be meaningless as a blueprint for life. Only by allowing variation in the nucleotide sequences could complex life develop. Life requires much greater complexity and specificity in its chemical structure than a simple repeating pattern allows.

The base pairs of nucleic acids (A, T, C, G) carry the data necessary for life to exist. They are the alphabet in which the story of life is written. An alphabet of four letters doesn't make for an interesting or instructive written language. They must have the ability for variability to carry true information. An alphabet that simply repeats is of no use.

RNA vs. DNA

There is also an information-carrying macromolecule related to DNA called RNA. Ribonucleic Acid (RNA) resembles DNA in many ways, but critical differences exist. One difference is that in the sugar-phosphate backbone of DNA, the sugar type is Deoxyribose. RNA contains the sugar ribose.

A significant difference between Ribose and Deoxyribose is that the latter can be twisted into the familiar double-helix structure of DNA. It is a more stable structure. Ribose most often forms into a single-stranded structure (WILLEY et al., 2009, p. 242). A single strand is limited in stability, hence the molecule's length.

Whereas DNA can be up to three billion base pairs in extent (such as the human genome), RNA is much shorter (HUMAN GENOME). RNA is sometimes categorized by the length of the molecule, such as by the terms "small" (200 bases) or "long" (>200 bases). Long RNA molecules can reach thousands of bases long (NOVIKOVA; HENNELLY; SANBONMATSU, 2012). Even that length is much shorter than the billions of base pairs of nucleotides that a DNA molecule can number.

Another difference between DNA and RNA is in the nucleic acids which form the base. Whereas DNA contains Adenine, Thymine, Cytosine, and Guanine (A, T, C, G) RNA is constructed with Adenine, *Uracil*, Cytosine and Guanine (A, U, C, G). The use of these nucleobases will be explained later in this document.

RNA is primarily a single strand of the sugar ribose and phosphate spine that hold the four types of nucleobases (A, U, C, G). RNA typically exists intact for about twenty minutes after its use (RNA MOLECULES). Because it is a single strand, RNA can be deconstructed more easily. Deconstruction happens regularly in the cell's machinery and is one way that life recycles the temporary components of protein synthesis.

How is it expressed?

DNA is expressed by a process known as "The central dogma of molecular biology". In a 1957 article Francis Crick, one of the two pioneers of DNA research coined the expression "The central dogma of molecular biology". By that phrase, Crick (1970) meant the concept that "once information has passed into protein, it cannot get out again." Put another way, "DNA makes RNA, and RNA makes Proteins, and Proteins make us" (CRICK, 1957, p. 138–163, 152). We can identify two critical insights from Crick's statement. First, information flow in living creatures is a one-way process. It starts from the information encoded into DNA, then passes through RNA, and finally, it is used to create a protein.

The second, more critical takeaway from Crick's statements is that the key to understanding how life continues is by transferring a non-physical entity: information. Though the molecules that carry the information are physical, the information itself is not. Life depends on something demonstrably non-physical for its continued existence. Let's examine how this information is utilized, and the concept should become more apparent.

The process of gene expression into proteins is complicated, so a simplified version will be portrayed for this study. Some details, such as the cell's ability to do error correction and some chemical processes, will be left out.[3] What remains will be sufficient to see the wonder that is God's creation of life.

[3] "In the replication of DNA, error checking of an incorporated nucleotide could occur before the next nucleotide is incorporated, or checking for errors could occur later. Apparently, checking and correcting occurs at both times. In the case of bacteria, and at least in some eukaryotes, the replication machinery itself checks for errors

Transcription

The first step in understanding the process of information processing in the cell is called transcription (see Figure 1). Transcription describes the process by which the information encoded in DNA is converted into the chemically similar RNA. Transcription occurs when DNA is transcribed (rewritten) into the language of mRNA (messenger RNA). This molecule is called messenger RNA because it acts as a messenger between DNA and the ribosomes where protein synthesis occurs.

For Eukaryotic cells, DNA resides in the nucleus.[4] The formation of a new protein begins with the arrival of a bundle of unique proteins at a specific gene. These proteins assemble into an enzyme called RNA Polymerase. The RNA Polymerase is built at a site along the DNA molecule called a "Promoter." Each gene contained in DNA has a segment of nucleotides before the start of the gene that lets the cell know that location is where to start in making a copy of the gene. RNA Polymerase then recognizes that the specific set of instructions for making the protein as required by the cell will follow the Promoter.

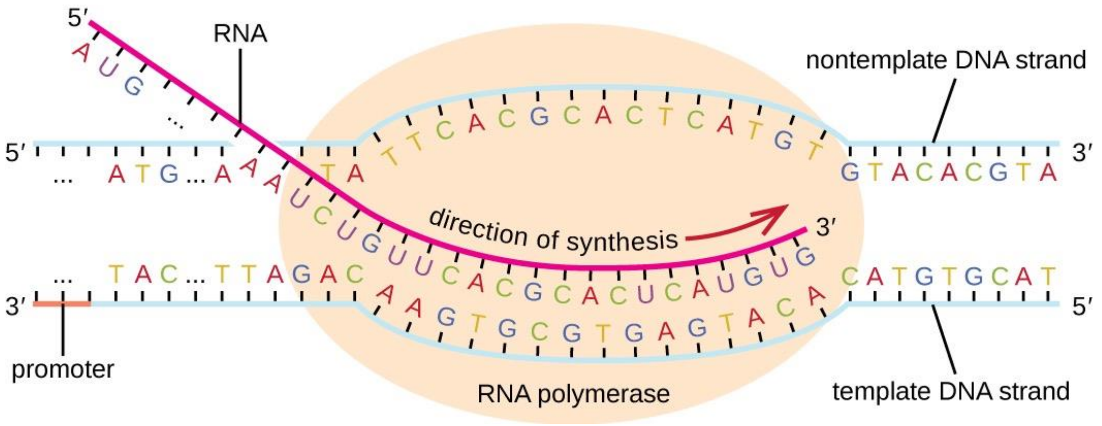
As noted earlier, transcription is the process by which a molecule of DNA is copied into a complementary strand of RNA. The process begins with assembling the RNA Polymerase at a specific site. The RNA Polymerase then opens the DNA at the start of the gene. The RNA Polymerase then makes a copy of one side of the split DNA molecule. The DNA strand used to create a duplicate is called the Template Strand. The RNA Polymerase makes a single-strand mRNA copy of the Template Strand, except that Thymine in the DNA is replaced by Uracil in the RNA.

The process ends when the RNA Polymerase reaches the end of the gene at an area called the Terminator. The mRNA is then cut loose and is shepherded out of the nucleus into the cell's cytoplasm by transport proteins. Several kinds of transport proteins exist, but only one acts to transport the mRNA out of the nucleus.

in the process of nucleotide incorporation, and an entirely separate machinery detects and corrects errors in DNA that has already been replicated" (SCHLEIF, 1993, p. 53).

[4] An Eukaryotic cell has a "true nucleus," while a Prokaryotic cell does not contain a nucleus (SCHLEIF, 1993, p. 2).

Figure 2 — Transcription



The entire process is called Transcription because one set of encoded instructions (the DNA template) has to be rewritten into another form (mRNA copy). The use of the linguistic term transcription is not because it resembles how humans copy written languages: it is the same process. The difference is that whereas human languages are well-understood, there is a not yet understanding of how the cell communicates its requirements (SCHLEIF, 1993, p. 119-125).

The mRNA is shepherded out of the cell's nucleus and taken to the cytoplasm. While in the cytoplasm, the mRNA is enclosed in a ribosome. A ribosome is created from proteins and rRNA (Ribosomal RNA). The various parts of the ribosome congregate together and then assemble around the mRNA chain. The ribosome is a marvel of biological machinery, in essence, a miniature factory.

Translation

A few words on proteins will make the process of translation clear. Most simply, a protein is a linked chain of amino acids. Since the protein is made of many amino acids, it is called a Polypeptide. Proteins have four levels of structure which determine their function and functionality. The first level (primary structure) is the order of the amino acids which comprise the protein. The second level (secondary structure) is determined by whether the amino acids are aligned into helixes or pleated sheets (coiled or folded). The third level of organization (tertiary structure) for a protein is the three-dimensional shape of the final product. The fourth level of protein organization (quaternary structure) is determined by the whole configuration formed by a combination of several amino acid chains (BAYNES; DOMINICZAK, 2015, p. 80).

If a newly produced protein is faulty, no matter how minor, it will not operate properly. Every sequence must be perfect because that will determine how the protein folds and functions. However, the cell recognizes faulty proteins and quickly destroys them (SCHLEIF, 1993, p. 53). Life cannot waste resources on something that doesn't work.

Translation is decoding an mRNA molecule into a polypeptide chain or protein (see Figure 3). The mRNA is organized into sections of three nucleotides each. Each combination of three nucleotides is called a codon. They are, in essence, three-letter words. The mRNA can be seen as a chapter in the book of the cell's operating manual.

A three-letter code is necessary because out of the roughly 500 amino acids that exist in nature, 20 different amino acids are used to make proteins in eukaryotic cells. A four-letter code would require more energy to maintain and make the creature less survivable. If a two-letter code were used, there would not be enough codons to select all 20 amino acids. There are four bases in RNA, and each base can appear in any of the three positions in the codon. So, if a two-letter code were used, mRNA could code for sixteen different amino acids ($4^2 = 16$). Whereas if four bases are utilized, mRNA can code for more amino acids than are needed ($4^3 = 64$). Four bases are necessary for the functioning of a cell. A meticulous study of microbiology reveals that the cell is a wonder in efficiency and design.

In summary, in eukaryotic cells protein production can best be described as using preexisting information to guide the process. Protein synthesis is more correctly described in terms of information transfer than physical forces (MEYER, 2010, p. 13). The DNA is opened, then the information stored there is read off and copied onto a complementary strand of mRNA through a process known as Transcription. The mRNA is shepherded out of the nucleus to the cytoplasm, where a ribosome forms around it. The ribosome reads off the three-letter words (codon) and arranges that information for tRNA to match. The tRNA matches the required codon in a process known as translation. The translation tells the tRNA the correct sequence for constructing a new protein.

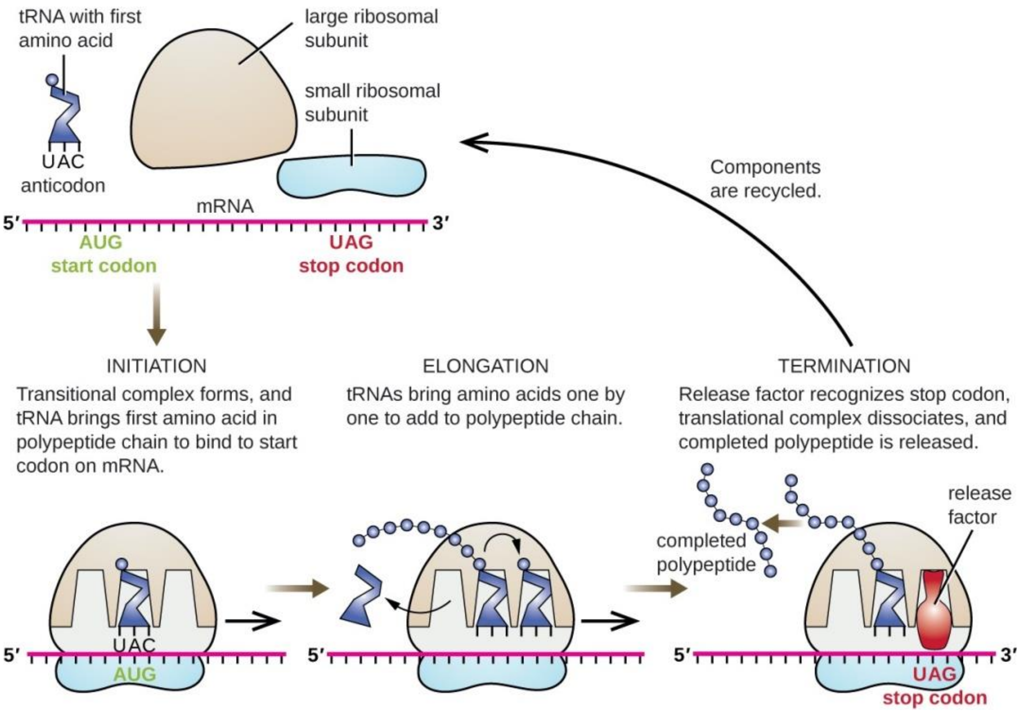
Protein creation can begin once the ribosome has assembled around the mRNA molecule. The three letters of a codon are read in sequence as the mRNA feeds through the ribosome. Inside the ribosome, a three-step process begins with the initiation phase. In the initiation phase, an anticodon on a tRNA (transfer RNA) molecule matches up with the codon on the mRNA. Each tRNA carries one amino acid, which is then detached and used to start the chain that will become a polypeptide (protein). About 500 tRNAs in a human cell are utilized to decode the 61 codons on mRNA (TORRES, 2019).

The next stage of protein production is termed elongation, and it involves adding more and more amino acids to the growing chain. Each amino acid is delivered by a separate tRNA molecule which carries only one amino acid. By matching the information transmitted in the mRNA molecule codon by codon, a long polypeptide chain (protein) is created.

The process of protein creation ends with the apply named termination phase. In this phase, the stop codon of the mRNA has been reached, signaling an end to production. A protein shaped like a tRNA arrives and binds to the stop codon site; a mismatch causes a water molecule to be added to the polypeptide chain. The water molecule prevents additional amino acids from binding, effectively ending the protein production (ALLISON, 2008, p. 535).

The human body produces massive numbers of protein per day. In our bone marrow alone, we manufacture 100,000,000,000 (one hundred trillion) hemoglobin proteins per second (MRNA TRANSLATION, 2010). All of the information for producing more than 10,000 proteins in the human body is stored in our DNA (PROTEIN, 2021).

Figure 3 — Translation



At this point some concepts become apparent. DNA and the process of protein synthesis are not like a language: they are a language. The entire process mirrors what happens in computers or factory machinery. The correlation to language is so evident that the terms chosen to describe what occurs are the same as those used when converting information between human languages. This awareness leads to the following question: "what is a written language?"

What is a written language?

What constitutes a language? Dr. Mark Aranoff (n.d.) of the Department of Linguistics at Stony Brook University identifies at least six components that every written language studied contains:

> Every language has a grammar with the following components: meaningful units akin to words (lexemes) and other grammatical markers; a system for arranging the meaningful units into sentences (Syntax); another for arranging the internal parts of words (Morphology); another for interpreting the meanings of utterances (Semantics); and principles for using language in actual discourse (Pragmatics).

What is significant for this study is that DNA exhibits these same factors. DNA exhibits all of the aspects of a proper language grammar.

For life, there is an alphabet. The letters are the nucleotides that constitute DNA, Adenine, Thymine, Cytosine, and Guanine (ATCG) in the cell. These letters are then combined in various ways to make words, codons. The syntax of DNA is the proper ordering of the codons into the instructions needed to produce proteins. The morphology of DNA is the cordoning off of specific regions of the DNA that act as chromosomes and genes. The semantics of DNA is revealed in the ribosome's function in the cytoplasm, where proteins are constructed. Finally, pragmatics describes the entire process of gene expression in terms of protein production, from transcription to translation. The language of DNA is the “why” of how life operates. Just as humans do not speak without purpose, neither does DNA. DNA is not like a language: it is a language.

The Atheist co-discoverer of the configuration of DNA, Francis Crick, could not help but notice the correlation between DNA and written language. As Stephen Meyer (2010, p. 327) notes on Crick’s work, “Like the information in machine code or written language, biological information is not just complex: it is also functionally specified.” Human language has six components necessary to function as a means for conveying information. DNA has the same components.

Beyond the mechanics of language is the purpose of language. Language exists to assist in transferring information from those who have it to those who don’t. There is an intentionality to the process. There is a meaning beyond the words and sentences. Language does not exist in a vacuum. Languages are used by thinking and reasoning minds. It is not unreasonable to say the same thing about DNA. It carries a message. For those who believe in God, it is a clear message of intentionally in life.

The mathematician David Berlinski (2019) explains the implications of the language correlates between DNA and human communication:

> By itself, a code is familiar enough, an arbitrary mapping or a system of linkages between two discrete combinatorial objects. The Morse code, to take a familiar example, coordinates dashes and dots with letters of the alphabet. To note that codes are arbitrary is to note the distinction between a code and a purely physical connection between two objects. To note that codes embody mappings is to embed the concept of a code

> in mathematical language. To note that codes reflect a linkage of some sort is to return the concept of a code to its human uses.

What is occurring in the cell is language in action and demonstrates a mind at work.

To further make this point, an example is apropos. What does this string of letters mean?

It looks to an untrained eye to be a string of random letters. A closer look reveals the four-letter bases for DNA. Can we translate this into another language? Just as there are various Apps and programs designed to translate human languages, there is a program designed to convert human speech into DNA sequences. When placed into the DNA translator, the string of letters written above renders as "In the beginning was the Word" (URBANO, 2013). DNA is a language.

How is information generated? Matter and energy all by themselves cannot produce information. They can only serve as a medium for storing or transporting information.

Information cannot be created without intent. Intent indicates the presence of a will; a will reveals the presence of a mind. There are no examples of information that are produced without intent.

The design and purposes for life are apparent to those who look with an open mind. A tacit admission that life appears to have come from a mind is admitted by the most ardent atheist. To quote Francis Crick (1990, p. 138), "Biologists *must constantly keep in mind* that what they see was not designed, but rather evolved." An atheist must constantly remind herself of her faith in the blind forces of the Theory of Evolution because life demonstrates that there is a mind behind it all, down to the smallest component.

Objections

A critic will deny that life is the special creation of God. They may argue, "But you have 98% of your DNA in common with a chimpanzee!" A few things can be said in response:

1) We do not share 98% of our DNA with chimps. The latest studies indicate a number closer to 90% (HUMANS, CHIMPANZEES, 2012). Even though we may share some of our genome, we share very little of our gene regulatory mechanisms with chimpanzees. The closeness should not be a surprise. All a person has to do is look at a chimp to see the morphological similarities. It is the differences that make humans unique. For a skeptic to argue otherwise is to undercut the strength of their argument.
2) Is this evidence for common descent or common design? Why should any similarities point automatically towards evolution? Can't they equally point to a single Creator who utilized the most efficient means, the same language for designing various creatures?
3) The critic should note that humans have much DNA in common with all life. We share 90% of our DNA with cats. Other creatures:

- Mouse: 85%
- Cow: 80%
- Fruit Fly: 61%
- Banana: 60%
- Humans and cabbage have about 45% of shared DNA (ANDRAS, 2022).

Another possible objection is a charge of dysteleology (poor design). A critic may object, "But what about that 98% of "Junk DNA in the human genome?" The charge is that since much of our DNA does not encode for protein production or any other purpose that we have discovered, it is "junk."

Once again, two things can be said in rebuttal:

1) An argument from ignorance is an informal logical fallacy. All that our ignorance about DNA proves is that we have a lot to learn.
2) The *Encyclopedia of DNA Elements* (ENCODE) project suggested in September 2012 that "Eighty percent of the human genome now has at least one biochemical function assigned to it" (ECKER; BICKMORE; SEGAL, 2012).

If we have learned this much this quickly, it seems reasonable to see what the near future holds for genetic research. After all, an Atheism of the Gaps is not logically persuasive. Junk DNA is not a compelling argument against divine design.

Limitations of the argument

In general, there are three ways by which we can logically reach a conclusion. Each method has its limitations and strengths. Some lead to greater certainty, some to less. How persuasive an argument is depends on two factors, the force of the argument and the ability of the hearer to understand and accept the conclusion.

A person who is convinced that there is no God or is motivated by some deep hurt in their past will not respond to a logical argument no matter the soundness of the proof. A person who is not emotionally damaged or upset is more likely to consider the evidence and arguments that another person puts forward. As Christians, we must be aware when the person with whom we minister is expressing legitimate doubt and when they are expressing deep pain. One situation calls for careful argumentation and evidence, and the other calls for pastoral care. The only way to know which is the best approach is to ask careful, probing questions.

Of the three general ways people can reason, the first is through deductive logic. Deductive logic proceeds by linking premises with conclusions. If all premises are true, the terms are clear, and the rules of deductive reasoning are followed, the conclusion is necessarily true. There are no other options.

A premise is a statement that acts as the foundation for reasoning. A premise can be true or false. For our arguments to be sound, we need all the premises of the syllogism to be true. If we start from false premises, we will almost always reach the wrong conclusions. Let's take a look at an example of deductive logical thinking:

Premise 1: All men are mortal
Premise 2: Socrates is a man
Conclusion: Socrates is a mortal.

Since the two premises are true and the form of the syllogism is valid, our conclusion is a sound one. Said another way, there is no other conclusion that we could reach. This way of reasoning is the definition of clear thinking. A person who denies the conclusion of a sound deductive argument is, by definition, unreasonable.

The second common way of reasoning is called inductive reasoning. Under inductive reasoning, the premises seek to supply strong evidence for (not absolute proof of) the truth of the conclusion. The truth of an inductive argument is probable, with its strength based upon the evidence given. An example will help to illustrate this truth:

A woman is walking in Australia when she sees a swan. It is a white swan. Later she sees more white swans. She reasons, “All swans are white.” If she has only seen a few examples of swans, she has a lower confidence level in her conclusion. If she has seen a great many white swans, then her confidence is correspondingly greater. As time goes on and all she sees are white swans, her certainty that all swans are white is very high; however, her theory is disproved if she travels to Argentina and observes a single black swan. Induction can lead to levels of confidence but never absolute certainty. Much of scientific reasoning is inductive.

The final way that people typically reason is designated abductive reasoning. Abductive reasoning is reasoning to the best explanation. It is a form of logical inference that goes from observation to a hypothesis that accounts for reliable data and seeks to explain relevant evidence. It is more intuitive in nature.

For example, if you walk into a room and there is a jar of jelly beans on the table and some jelly beans spread out on the table, you may ask yourself, “Where did the jelly beans on the table come from?” The obvious answer is that the jelly beans came from the jar on the table. But how did you know this? Did you reason deductively and conclude that the only place the beans could have come from was the jar? Have you done an inductive study of the times that jelly beans have fallen out of jars and then reached your conclusion? The answer is that you were thinking abductively, reasoning to the best explanation.

The key to understanding abductive reasoning is that there is a hierarchy of methods in cognitive certainty. Deductive reasoning leads to absolute certainty, and inductive reasoning leads to levels of confidence but not absolute certainty. Abductive analysis does not prove its case, nor does it give high levels of assurance for its conclusions. The kind of reasoning we do when we "see" design in nature is more like abductive reasoning than the other forms. We are arguing to the best explanation. Though it may be evident to the believer in God that there is a mind behind life, an unbeliever can reject our conclusion without crossing the line into irrationality.

How should we use this information?

For Christians excited to share the discoveries of the design of life, what advice can we give? First, anytime we express an abductive argument, we must recognize the limitations of the claim. It does not provide "proof" that God is real. We should share what we know with humility and as part of a more comprehensive argument of God's existence.

We need to clarify to our friends that we are not making a God of the gaps argument. A "God of the gaps" argument is when there is some unknown aspect of the universe, and we just say, "God did it!" The problem with this kind of argument is that as time goes by, science makes discoveries. It makes Christians look bad when a natural cause is found for a natural event after a Christian has claimed that God did I directly. Though God is undoubtedly the Creator and Sustainer of the universe, attributing the direct action of God to something that He has caused to take place through natural means leads to God taking a minor role in the unbelievers' eyes. From a philosophical point of view, the inherent problem with a God of the Gaps apologetic is that it relegates God to only a portion of creation— the portion that we do not understand yet.

Naturalism employs a "no-God-of-the-gaps" argument. In addition, a "God-of-the-gaps" argument is based on what we don't know. The "Design Inference" is based on what we do know. We do know that language and information come from minds. There is no other source demonstrated to create information that is not a mind or the product of a mind (think of computer here).

The next step is to remember to make those who disagree with us an ally, not an enemy. To do this we need to build bridges from their worldview to ours. We can start by asking questions such as, "Can you see why I believe that the informational content of DNA is more similar to what we know comes from minds instead of blind forces?" This tactic can turn our interlocutors and us from opponents to friends who simply see things differently.

Another way to reach those who don't see the need for God is to take them on a mental journey with you. Start by asking them to look at a page from a book with writing on it. Ask them, "What do that paper and ink consist of chemically/physically?" "Is there something else here that is not tangible?" The most crucial thing in the book cannot be measured by its physical properties. "What is the missing element?" Information is the most critical thing in a book but is not the page or the ink. You can ask them, "Do you see that matter and energy may carry information but is not a likely source for the origin of that information?" In our universal experience, information comes from minds.

Using the analysis of Emmanuel Kant, we can reason from intelligent design to a mind, but not directly to the God of the Bible. Sometimes, helping others see that something can be real yet not tangible can help them think about God's existence differently.

The evidence from DNA helped to convince at least one life-long atheist. The late Antony Flew was once labeled "The World's Most Notorious Atheist" (FLEW; VARGHESE, 2007, p. 1). In a 2004 conference, Flew announced that he had changed his mind after decades of advocating for atheism. To quote Dr. Flew himself:

> In this symposium, when asked if recent work on the origin of life pointed to the activity of a creative Intelligence, I said: Yes, I now think it does [...] almost entirely because of the DNA investigations. What I think the DNA material has done is that it has shown, by the almost unbelievable complexity of the arrangements which are needed to produce (life), that intelligence must have been involved in getting these extraordinarily diverse elements to work together. It's the enormous complexity of the number of elements and the enormous subtlety of the ways they work together. The meeting of these two parts at the right time by chance is simply minute. It is all a matter of the enormous complexity by which the results were achieved, which looked to me like the work of intelligence (FLEW; VARGHESE, 2007, p. 74-75).

The discovery of the informational content of DNA drove Flew to change his mind.

Fun facts about DNA

- Each cell in our bodies contains roughly 2 meters of DNA.
- Humans have ~100,000,000,000,000 (100 trillion cells).
- If you put all the DNA molecules in your body end to end, the DNA would reach from the Earth to the Sun and back over 600 times (100 trillion times six feet divided by 92 million miles)! (NOVA ONLINE, 2001).

In recent news, Tom Ran, a researcher at the Weizmann Institute of Science in Israel, discussed a new way to use DNA in computing. He said, "We can get three trillion computers, working in parallel, in a space the size of a water droplet." The 0s and 1s of conventional computers are replaced with the four DNA bases: A, C, G, and T. Operations can be translated into strands of DNA using these bases, and the way the DNA strands interact with each other produces new strands which can be decoded as output values (STUART, 2012). A computer made naturally from DNA far superior to anything made by humankind is shocking. This proposal further proves that the design of life did not come about by a combination of chance and natural law.

Conclusion

In his book *The road ahead* computer software creator and billionaire Bill Gates brought up the subject of the miracle of DNA. He wrote, "DNA is like a computer program but far, far more advanced than any software ever created" (GATES; MYHRVOLD; RINEARSON, 1995, p. 228). A computer program can be stored on chips, written on paper, or transmitted by sound or light waves. The program is the encoded information that runs a computer. Information cannot be restricted to the physical media that transports the information because there are various ways in which that information may be transmitted. The message is the same whether it is carried on pages in a book, soundwaves, or photons from a computer screen. Information is not a physical entity.

This essay has been a brief introduction to one aspect of Intelligent Design. On the Earth, DNA is the language in which life is written. The language of DNA is more flexible, precise, and intricate than any humanly contrived form of communication. The expression of that language into fulfilling the needs of the cell by producing protein is far more precise and complex than any human language. The logical implication is that the origin of DNA is not in the blind forces of nature but from a mind that is behind nature. An intellect of unimaginable brilliance and subtlety. DNA points to the mind of the Creator.

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