Francis Collins: The language of God – a scientist presents evidence for belief

Pocket Books, Simon & Schuster 2007

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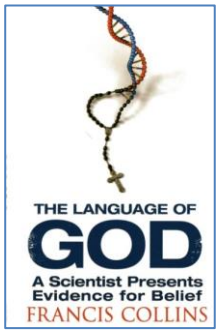

Francis Collins is a geneticist, and the Director of the Human Genome Project which has deciphered the code of human DNA. The book tells the story of his own journey to faith, and his conclusion that 'there is no conflict in being a rigorous scientist and a person who believes in a God who takes a personal interest in each one of us'. But it also offers an eye-opening tour of the human genome, explains why it offers conclusive evidence for evolution, and summarises the various approaches to the question of evolution and faith. He defines himself as an advocate of theistic evolution. If you want to know why Richard Dawkins' argument that evolution and Christian belief are incompatible stands on shaky ground, read this book!

- The human genome is 3 billion letters long. Just to read it aloud, day and night, would take 31 years.

- The principles of faith are.. complementary with the principles of science. 3

- There is no conflict in being a rigorous scientist and a person who believes in a God who takes a personal interest in each one of us. Science's domain is to explore nature. God's domain is in the spiritual world, a realm not possible to explore with the tools and language of science. It must be examined with the heart, the mind, and the soul – and the mind must find a way to embrace both realms. 6

- Science is the only reliable way to understand the natural world, and its tools when properly utilized can generate profound insights into material existence. But science is powerless to answer questions such as 'Why did the universe come into being?', 'What is the meaning of human existence?', 'What happens after we die?'. One of the strongest motivations of humankind is to seek answers to profound questions, and we need to bring all the power of both the scientific and spiritual perspectives to bear on understanding what is both seen and unseen. 6

- CS Lewis: 'if there was a controlling power outside the universe, it could not show itself to us as one of the facts inside the universe – no more than the architect of a house could actually be a wall or staircase or fireplace in that house.' 29

- If God exists, then He must be outside the natural world, and therefore the tools of science are not the right ones to learn about Him. 30

- Annie Dillard (Teaching a stone to talk): Now we are no longer primitive. Now the whole world seems not holy. . . . We as a people have moved from pantheism to pan-atheism. . . . It is difficult to undo our own damage and to recall to our presence that which we have asked to leave. It is hard to desecrate a grove and change your mind. We doused the burning bush and cannot rekindle it. We are lighting matches in vain under every green tree. Did the wind used to cry and the hills shout forth praise? Now speech has perished from among the lifeless things of the earth, and living things say very little to very few. . . And yet it could be that wherever there is motion there is noise, as when a whale breaches and smacks the water, and wherever there is stillness there is the small, still voice, God's speaking from the whirlwind, nature's old song and dance, the show we drove from town. What have we been doing all these centuries but trying to call God back to the mountain, or, failing that, raise a peep out of anything that isn't us? What is the difference between a cathedral and a physics lab? Are they not both saying: Hello? 39

- The past century has seen an unprecedented number of revisions in our view of the universe. Matter and energy, previously assumed to be utterly different entities, were shown by Einstein to be interchangeable.. The dualism of wave and particle was unanticipated and astounding to many classically trained scientists. The Heisenberg uncertainty principle of quantum mechanics, the realization that it is possible to measure either the position or the momentum of a particle, but not both at once, created particularly disruptive consequences for both science and theology. Perhaps most profoundly, our concept of the origin of the universe has undergone a fundamental change over the course of the past 75 years. 59-60

- Strange concepts.. neutrons and protons.. are made up of 6 flavors of quarks.. A dizzying array of other particles, from photons to gravitons to gluons and nuons, create a world so foreign to everyday human experience that they cause many non-scientists to shake their heads in disbelief.. For those who argue that materialism should be favoured over theism, because materialism is simpler and more intuitive, these new concepts present a major challenge… But puzzling as the verbal descriptions of these newly discovered phenomena are, their mathematical representation invariably turns out to be elegant, unexpectedly simple, and even beautiful. 61 Why should matter behave in such a way? In Eugene Wigner's phrase, what could be the explanation for the 'unreasonable effectiveness of mathematics?' 61

- The Big Bang. Evidence – background radiation (Penzias and Wilson in 1965); ratio of elements throughout the universe is constant, suggesting a single event. 'Physicists are in agreement that the universe began as an infinitely dense, dimensionless point of pure energy. The laws of physics break down in this circumstance, referred to as a singularity.

- Astrophysicists Robert Jastrow – 'Now we see how the astronomical evidence leads to a biblical view of the origin of the world. The details differ, but the essential elements and the astronomical and biblical accounts of Genesis are the same; the chain of events leading to man commenced suddenly and sharply at a definite moment in time, in a flash of light and energy.' 67

- I cannot see how nature could have created itself. Only a supernatural force that is outside of space and time could have done that. 67

The Big Bang was 14m years ago. Sun came into being 5 billion years ago, planets/Earth 4.55 billion years ago. Earth habitable to life by 4 billion years ago. 150m years after that it was teeming with life. 'No current hypothesis comes close to explaining how in the space of a mere 150 million years, the prebiotic environment that existed on planet Earth gave rise to life. that is not to say that reasonable hypotheses have not been put forward, but their statistical probability of accounting for the development of life still seems remote.'90

The Anthropic Principle. If the rate of expansion 1s after the Big Bang had been smaller by even 1 part in 100,000 million million, the universe would have collapsed; greater by even 1 part in a million, stars and planets could not have formed. Hawking: 'it would be very difficult to explain why the universe should have begun in just this way, except as the act of a God who intended to create beings like us'. 75

Augustine on Genesis: 'in matters that are so obscure and far beyond our vision, we find in Holy Scripture passages which can be interpreted in very different ways without prejudice to the faith we have received. In such cases, we should not rush in headlong and so firmly take our stand on one side that, if further progress in the search for truth justly undermines this position, we too fall with it'. 83

- Science should not be denied by the believer, it should be embraced. The elegance behind life's complexity is indeed reason for awe, and for belief in God – but not in the simple, straightforward way that many found so compelling before Darwin came along. 86

- Fifty years ago, famous experiments by Stanley Miller and Harold Urey reconstructed a mixture of water and organic compounds that might have represented primeval circumstances on Earth. By applying an electrical discharge, these researchers were able to form small quantities of important biological buildblocks, such as amino acids. The finding of small amounts of similar compounds within meteorites arriving from outer space has also been put forward as an argument that such complex organic molecules can arise from natural processes in the universe. Beyond this point, however, the details become quite sketchy. How could a self-replicating information-carrying molecule assemble spontaneously from these compounds? DNA, with its phosphate-sugar backbone and intricately arranged organic bases, stacked neatly on top of one another and paired together at each rung of the twisted double helix, seems an utterly improbable molecule to have "just happened"—especially since DNA seems to possess no intrinsic means of copying itself. More recently, many investigators have pointed instead to RNA as the potential first life form, since RNA can carry information and in some instances it can also catalyze chemical reactions in ways that DNA cannot. DNA is something like the hard drive on your computer: it is supposed to be a stable medium in which to store information (though, as with your computer, bugs and snafus are always possible). RNA, by contrast, is more like a Zip disk or a flash drive—it travels around with its programming, and is capable of making things happen on its own. Despite substantial effort by multiple investigators, however, formation of the basic building blocks of RNA has not been achievable in a Miller-Urey type of experiment, nor has a fully self-replicating RNA been possible to design. The profound difficulties in defining a convincing pathway for life's origin have led some scientists, most notably Francis Crick (who with James Watson discovered the DNA double helix), to propose that life forms must have arrived on Earth from outer space, either carried by small particles floating through interstellar space and captured by Earth's gravity or even brought here intentionally (or accidentally) by some ancient space traveler. While this might solve the dilemma of life's appearance on Earth, it does nothing to resolve the ultimate question of life's origin, since it simply forces that astounding event to another time and place even further back. 91

Fossil record:

- Single celled organisms only, before 550m years ago
- 550m years ago, the 'Cambrian Explosion' – lots of diverse invertebrate body plans
- 400m years ago – plants, derived from aquatic life forms
- 370m years ago – land animals
- 230 m years ago – dinosaurs
- 65m years ago – asteroid collision wipes them out, paving way for mammals to flourish
- 195,000m years ago – first homo sapiens
- 30,000 years ago – Neanderthals die out
- 13,000 years ago – 'hobbits' of Indonesia die out

Darwin proposed that all living spp are descended from a small set of common ancestors –perhaps just one. He held that variation within a species occurs randomly, and that the survival or extinction of each organism depends upon its ability to adapt to the environment. This he termed natural selection.
Far from being ostracised by the religious community, he was buried in Westminster Abbey.
Darwin: 'there is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning, endless forms most beautiful and most wonderful have been and are being evolved' – last sentence of Origin. 'I feel compelled to look to a First Cause having an intelligent mind in some degree analogous to that of man; and I deserve to be called a Theist'. 99

- No serious biologist today doubts the theory of evolution to explain the marvellous complexity and diversity of life. in fact, the relatedness of all species through the mechanism of evolution is such a profound foundation for the understanding of all biology that it is difficult to imagine how one would study life without it, 99.
- Investigations of many organisms, from bacteria to humans, revealed that this 'genetic code', by which information in DNA and RNA is translated into protein, is universal in all known organisms. No tower of Babel was allowed in the language of life. 104

- Evolution, as a mechanism, can and must be true. But that says nothing about the nature of its author. For those who believe in God, there are reasons now to be more in awe, not less. 107

BioLogos – science and faith in harmony

Collins prefers theistic evolution, but suggests it could be termed BioLogos. It's the dominant position of serious biologists who are also serious believers. 'This perspective makes it possible for the scientist-believer to be intellectually fulfilled and spiritually alive, both worshipping God and using the tools of science to uncover some of the awesome mysteries of His creation.' Few theologians are familiar enough with it to endorse it in the face of Creationism or ID. John Paul II was; 'new findings lead us toward the recognition of evolution as more than a hypothesis' – saying also that 'if the origin of the human body comes through living matter which existed previously, the spiritual soul is created directly by God'. 'BioLogos doesn't try to wedge God into gaps in our understanding of the natural world; it proposes God as the answer to questions science was never intended to address, such as 'How did the universe get here?', 'What is the meaning of life?', 'What happens to us after we die?'… It is not intended as a scientific theory. Theistic evolution allows science and faith to fortify each other like 2 unshakeable pillars, holding up a building called Truth.

- Theodosius Dobzhansky (1900-1975), a prominent scientist who subscribed to the Russian Orthodox faith and to theistic evolution: "Creation is not an event that happened in 4004 BC; it is a process that began some 10 billion years ago and is still underway.. . . Does the evolutionary doctrine clash with religious faith? It does not. it is a blunder to mistake the Holy Scriptures for elementary textbooks of astronomy, geology, biology, and anthropology. Only if symbols are construed to mean what they are not intended to mean can there arise imaginary, insoluble conflicts."206

Deciphering God's Instruction Book – the lessons of the human genome

The gene count for people is 20-25,000 protein coding (active) genes. It's about the same for worms, flies, simple plants. Our complexity can't arise from the number of separate instruction packets, but from the way they are utilised – have our component parts learn how to multitask? Compare language. The average educated English speaker has a vocab of c.20,000 words. They can be used to construct a simple instruction manual or to write *Ulysses.* Worms et al seem to need an extensive vocabulary to function, but use these resources in less elaborate ways than we do.
There is very low genetic diversity amongst human beings – which suggest a common set of ancestors. It's been calculated at 10,000 founders, living 100,000-150,000years ago. This fits the fossil record, which places them in E Africa. The human genome compares closely with that of other mammals. In fact, the match follows the evolutionary tree and the fossil record.
'Darwin could hardly have imagined a more compelling digital demonstration of this theory than what we find by studying the DNA of multiple organisms'. The variation he postulated is supported by naturally occurring mutations in DNA. They occur at a rate of c. 1 error to every 100m base pairs per generation – means we each have c.60 new mutations not in our parents, mostly in non-essential parts of the genome (which has lots of 'junk' stretches).
The distinction between macro and micro evolution is artificial – salt and freshwater sticklebacks have evolved differently; but larger changes that result in new spp are just the result of smaller incremental steps. We see evolution in action in malaria parasites developing resistance to drugs, and in the HIV virus. Not only biology but also medicine would be impossible to understand without evolution.
God cannot have just used the same design principles in different creatures. We can follow evolution at genetic level. Eg the order of genes along the human and mouse chromosomes is the same over long stretches; and there are mutated, truncated elements at various points which have no function but are present in both – suggesting a common ancestry. Special sequences occur at the tips of all primate chromosomes. We have one fewer than chimps; two have fused, and the special sequences are in the middle. Chimps and we have a jaw muscle gene in common, but ours has mutated into a 'pseudogene' – it doesn't work. We have weaker jaws and bigger brains.

These egs 'provide the kind of molecular support for the theory of evolution that has convinced virtually all working biologists that Darwin's framework of variation and natural selection is unquestionably correct'. 141 Arthur Peacocke, molecular biologist and Anglican priest, has written a book called *Evolution – the disguised friend of faith?*

Genesis, Galileo and Darwin

'From a biologist's perspective, the evidence in favour of evolution is utterly compelling. Darwin's theory of natural selection provides a fundamental framework for understanding the relationships of all living things. The predictions of evolution have been borne out in more ways than Darwin could have possibly imagined when he proposed his theory 150 years ago, especially in the field of genomics'. 146
Timeclock of the appearance of life, p148.
The Hebrew word used in Genesis 1 for day (yom) can be used both to describe a 24 hour day and to describe a more symbolic representation. There are multiple places in the Bible where yom is utilised in a nonliteral context, such as 'the day of the Lord'.
Galileo – his observations were accepted by many Jesuit astronomers, but resented by rival academics, who urged the Church to intervene. It obliged, citing eg Eccl 1.5, 'the sun rises and the sun sets, and hurries back to where it rises'; or Ps 104.5, 'the earth.. can never be moved'.

Augustine – p 156.
Usually, even a non-Christian knows something about the earth, the heavens, and the other elements of this world, about the motion and orbit of the stars and even their size and relative positions, about the predictable eclipses of the sun and moon, the cycles of the years and the seasons, about the kinds of animals, shrubs, stones, and so forth, and this knowledge he holds to as being certain from reason and experience.
Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show a vast ignorance in a Christian and laugh it to scorn.
The shame is not so much that an ignorant individual is derided, but the people outside the household of the faith think our sacred writers held such opinions, and, to the great loss of those for whose salvation we toil, the writers of our Scripture are criticized and rejected as unlearned men. If they find a Christian mistaken in a field which they themselves know well and hear him maintaining his foolish opinions about our books, how are they going to believe those books and matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven, when they think their pages are full of falsehoods on facts which they themselves have learned from experience in the light of reason?

Buzz Aldrin took communion on the surface of the moon – but it wasn't reported because Madalyn Murray O'Hair had filed a suit against NASA for allowing previous astronauts to read John 1 when looking down at the earth.

Dawkins and Dennett proclaim that an acceptance of evolution in biology requires an acceptance of atheism in theology. Dawkins argues, mostly by setting up straw men and demolishing them:

1. Evolution full accounts for biological complexity and the origins of humankind, so there's no need for God – but of course God could have chosen to create by means of evolution. Dawkins seems to have 'a vitriolic personal agenda, rather than a reliance on the rational arguments' he cherishes so much in the scientific realm
2. Religion is antirational, because it's belief in the absence of evidence.
3. Harm has been done in the name of religion – but also good.

The main flaw of his claim that science demands atheism is that it goes beyond the evidence. Atheism itself must be considered a form of blind faith – it adopts a belief system that cannot be defended on the basis of pure reason. If God is outside nature, science can neither prove nor disprove his existence.

Creationism – dismisses radioactive decay clocks, fossils, genome sequences as designed to make the universe look old even when it isn't…

Intelligent Design – relies on irreducible complexity, but we keep finding evidence that the cited mechanisms could indeed have developed gradually. It's God of the gaps. Human flaws belie it – imperfections of the human spine, wisdom teeth, the appendix; even the eye has shortcomings. ID also suggests God is clumsy, needing to intervene to fix the inadequacies of his own initial plan for creating the complexity of life.#

Science is not the only way of knowing. Imagine a man who sets out to study deep sea life with a 3" net. He is amazed at what he finds; and concludes there is no life smaller than 3"… If we are using the scientific net to catch our particular version of truth, we should not be surprised that it does not catch the evidence of spirit. parable told by Arthur Eddington. Scientists should consider the limits of their own tools.