

Genes, Evolution, and the Word of God in Creation

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Evolution And Mechanisms Of Genetic Complexification

The methods of molecular genetics have produced results that allow us to better understand how genes cooperate to form functional genomes. One important discovery is that genes interact with one another to form genetic programs. Of particular interest to evolutionary biologists are the insights how such programs have evolved. One result of fundamental importance is that the genome of human beings functions the same way as genomes of other organisms do. This is not a statement intended to reduce human beings to animals. Rather, its purpose is to stress that our genome like all genomes, is the result of natural history. Just as our bodies have evolved out of the depths of nature, so have the genetic instructions that shape it. We know that because genes that were isolated from the fruit fly *Drosophila* are also present in our genome. We not only share genes with flies but also with yeast, worms and frogs. This is because genes might be so essential for these organisms that they have been passed on over hundreds of millions of years of organismic evolution.

Over the last hundred and fifty years or so scientists discovered that there are two groups of genes. One group determines organismic traits. Roughly during the middle of the nineteenth century, Father Gregor Mendel found the laws of inheritance. He found the rules by which paternal traits are passed on through the filial generations. He carefully selected various traits of garden pea to follow the process of how these traits were passed on to the next generations. He followed how alternative characters such as tallness, dwarfism, presence or absence of colors in seeds and blossoms showed up in the sequence of generations. In 1865 he published the results showing that the inheritance of these traits by the next generation followed simple statistical laws. Mendel's discoveries were amply confirmed in other organisms, including man. A typical freshmen course in biology today still makes the students familiar with the Mendelian laws of inheritance. The area investigating the problem of how traits are inherited is called transmission genetics.

Around the turn of the century it became obvious that genes not only control how traits are inherited from one generation to the next but that they also control plant and animal development. For example experiments that studied regeneration demonstrated that only fragments that contained a cell-nucleus were capable of regenerating. In contrast, fragments without nucleus never regenerated and soon died. Other experiments showed that the nucleus was also in control of embryonic development. The German embryologist/cytologist Theodore Boveri, for example, combined fragments of sea urchin eggs with nuclei from different sea urchin species. He showed that the development followed the patterns of development typical of the species that provided the nucleus. At that time, however, the tools were not available to find out how genes guide and control the development of embryos.

The methods necessary to investigate how genes work in embryogenesis became only available over the last twenty years. Thanks to these new tools a second type of genetics started to blossom which is significantly different from transmission genetics: developmental genetics. Developmental genetics makes the important point, that genes interact with one another to form genetic programs. These programs guide the differentiation process of the developing embryo.

The evolution of developmental programs

How genes form genetic programs is a matter of current research. It is already well established, however, that genes communicate with one another. Regulatory genes produce regulatory proteins that act as switches to turn other genes on and off. In this way genes can talk to each other and control what happens in the embryo at different times and places. This insight into how developmental programs work is important for better understanding how evolution works. If the programs that control embryogenesis change during evolution, the organisms they form might become different too. Significant evolutionary change might therefore depend upon significant change in developmental programs.

We now know from developmental genetics that genetic programs actually did change in evolution. As already mentioned, the rather surprising discovery so far is that developmental genes (genes that control embryogenesis)

are shared among a wide variety of different organisms. If developmental genes are similar, how can the programs they form become so very different from one another? How does a genetic program that drives the development of a fish, for example, differ from the one that controls the embryogenesis of a mouse? As far as we already know, the evolution of genetic programs works through a three-step process. In a first step, individual genes, groups of genes (modules) or entire genomes might duplicate. In a second step, the duplicated entities become different through mutations. Finally, the duplicated genetic entities may become integrated into the original program. The first step in the process produces redundant genomic programs that at first might not be used. This situation allows mutations to accumulate in the redundant (duplicated) program without jeopardizing survival. Organisms can still function normally due to the presence of the original program. In a third step, the duplicated and varied genetic units might become integrated into the original program. This can happen in various ways. Once a genome or part of a genome is duplicated, its organization is also duplicated. For example, if the modules (genomic sequences) ABCD become duplicated and then mutates into A'B'C'D' there are 16 possibilities to connect the duplicated modules to the original ones. The connection of A to A' might not change the developmental program of the organism significantly. Connecting, however, A to either B', C', or D', might produce a new program radically different from the old one.

This third step (connecting the mutated program to the original one) is critical and dangerous. New programs put together probabilistically (by chance) might usually not work. Once in a while, however, the tinkering of nature results in a functional program that guides embryonic development in new ways. Whether such a genetic invention works or is eliminated depends on whether the new organism competes successfully for resources so that it can propagate.

There is good evidence that new genetic programs are required for the emergence of new body plans in evolution. During the millions of years of evolutionary time nature invented new and successful organisms. For example, the genome that controlled the embryology of flatworms already existed about 800 million years ago. Significant parts of this genetic program are still present and functional in sea urchins and in vertebrates. The conclusion is that the genes that controlled flatworm development became at least partially integrated into the more recent programs of sea urchins and vertebrates. In short, I share Rudolf Raff's view who writes: "In fact, radical evolutionary alterations in development may underlie macro evolutionary change."¹

What traces would such genetic events leave in the fossil record? First, it would demonstrate that evolution might frequently occur in jumps, not gradually. By this I mean that new anatomical features might appear suddenly in the fossil record. In this view, "suddenly" is not so much referring to a time span. It rather addresses the reason why there are gaps in the fossil record. In this view, gaps are frequently not so much due to an incomplete fossil record but reflect the actual history of saltational events.

Mechanisms of genetic complexification

Genetic complexification is not simply a matter of gradually adding more genes to an already existing genome. Such a process is necessary but not sufficient. Complexification results from the integration of duplicated genes and entire genetic modules. It is the synthesis of new genomes through the integration of new genetic parts. The result of such integration is the emergence of new genomes with properties different from the properties of their genetic elements. Genomes are capable of controlling development, of organizing space-time in ways that their genetic elements in isolation cannot. Complexification is a nonlinear process because the qualities of the emergent wholes do not exist in their parts. Complexification in genetic evolution is the result of synthesis.

True integration does not destroy the properties of the parts. Rather the whole that emerges from integration is dependent on the properties of the parts yet transcends the parts: genomes can do what their (isolated) parts cannot. Genomic evolution is a nonlinear process that uses properties of the parts to generate totally new properties of the whole that emerges through their synthesis. Or as Ian Stuart put it in a recent book review: "Life is a nonlinear process of increasing complexity, explicable in terms of dissipative self-organization."²

Genes are already complex structures that integrate regions that carry out different functions. There are regions that act as switches to turn genes off or on. Other regions control the amount of gene activity, still other areas contain the information how to synthesize proteins. The different regions are integrated into functional unities, the genes. Genes, therefore, are physiological units with clear-cut characteristics. Therefore genes are not malleable. Genes are “hard” not “soft.” Genes are well defined elements and because of that they are capable of interacting with one another to produce superstructures: genomes. In organismic evolution, increasingly complex genomes emerged from the integration of genetic programs that had themselves emerged from the integration of genes.

Similar genes can produce significantly different genetic programs depending upon how they are connected with one another. Therefore, similar genes are capable of controlling the development of very different organisms. Roughly, genes can be compared to LEGO blocks. One can build houses, airplanes, cars, or even space-ships from just a few different parts. An interesting method of construction is to first build an element that integrates different blocks, lets say an arch. In a second step several arches might become arranged in a row. Then the row is duplicated and one row put on top of the other. This then might look like a Roman aqueduct. Alternatively, a series of duplicated arches may be used to construct the walls of a cathedral. In both cases the blocks that build the arches are identical yet how the arches are arranged results in very different architectures. The point is that similar genes can produce rather different genetic programs depending upon how they interact with one another.

Nature builds complexity through sequential syntheses bottom-up. Elements that were synthesized in a previous synthetic step become integrated into new unities. The physical and the living world emerges through sequential integration of elements that were previously integrated. Teilhard de Chardin was precisely right: *It is synthesis that creates novelty.*

Is Evolution Goal-oriented?

The creative principle at work throughout evolution brings forth new wholes through integration. This creative process is ubiquitous and constantly at work. Even after disintegration and catastrophes, the process starts over again from the elements left over.

That evolution generates increasing complexity is today accepted again.³ This acceptance was only possible, however, after the concept of complexification had become separated from its embrace with progress. Linear progress thinking during the period of the Enlightenment, from Leibniz to Lamarck, had to be disentangled from the concept of betterment. At issue was, and to some extent still is, the fundamental difference between a Lamarckian and the Darwinian world-view. With Leibniz, Lamarck saw the process of evolution as a progression of the world towards increasing perfection. For Lamarck, simple forms of organizations were less perfect than complex ones. Darwin objected to such finalism, and rejected the notion that there was an intrinsic drive in nature towards perfection. He interpreted “progress” in evolution as the result of adaptation. Where Darwin encountered improvements in the course of evolution, he found that such “progress” could be explained as the result of a natural two-step process. The first step was the spontaneous occurrence of variations. Then, natural selection favored the survival of the best adapted variations. As the environment changed in the history of the world, those organisms that by chance were (even slightly) better adapted to the new conditions produced (slightly) more offspring than the less adapted ones. Over time, such (slight) advantage slowly but surely helped the adapted organisms to out-compete the less adapted ones. No divine designer or supernatural drive towards increasing perfection was necessary to understand how organisms had evolved. According to Darwin “survival of the fittest” was the natural process that brought forth organisms that perfectly fit their environment.

Today, biologists accept this Darwinian mechanism of evolution. Variation and natural selection has been demonstrated time and time again to be a fundamental law for the evolution of organisms. Those plants and animals that are capable of extracting more energy out of the environment than their competitors will survive. This law is also the basic rule for evolution and survival in the world of business. There, money is the energy

that drives the process. Those businesses capable of extracting money from the markets more efficiently than their competitors will slowly but surely out compete them. The result is predictable: but is such a process goal-oriented, is this “teleology?” I don’t think so, because competition in nature and in business is a process the outcome of which is not determined at the start. The process is rather like a game. Yes, there will be a winner (most likely), but how the game will end is not already clear from the start (at least not for a good game). Who will win is determined what really happens out of all the possibilities that could also have happened. A game creates its reality as it proceeds from the present into the immediate future. The excitement at the ball park is to experience history in the making, to participate actively or passively in “genuine historical events.” The history of how a particular game will end is not already out there, their history is not prefabricated. There are no final causes towards which the game has to develop (unless the game is fixed). History is not like a train that runs along a track that is already there. Therefore, history cannot be goal-oriented because true history moves into an open (undetermined) future. In contrast, a teleological process moves on a preconstructed, programmed path. Aristotle wondered about how it was possible that organisms always developed in a predictable way. He was deeply impressed that a chicken egg always developed into a chicken, not into a fish or a lizard. He assumed that this was due to the presence of a final cause that oriented the process from beginning to end. Because for Aristotle the cosmos was an organism, he concluded that the history of the cosmos, similar to the developmental history of an animal must also be under the control of a final cause.

Of course he was right about animal development being under the control of a “final cause.” We know today that the outcome of a developing organism is predictable because the process is under the control of a genetic program. We also know, however, that there is no such program that controls the history of the universe. Aristotle’s extrapolation from organisms to the cosmos proved to be illegitimate. Modern science cannot find any evidence that the evolution of the universe is a goal-oriented process.

This result of modern science still produces serious friction in the relationship between theologians and scientists. Some theologians still expect from scientists to demonstrate Divine providence in cosmogenesis. Modern science, however, cannot find any evidence for supernatural guidance in universal evolution. There is no evidence of a divine plan being executed by nature. The universe as it is today is the outcome of natural history, not supernatural intervention(s). The relevant point for theology is that science cannot prove that the Christian faith “is right.”

If universal evolution is the result of natural history, does this imply that human beings evolved by accident? From a scientific perspective the answer might be: “yes” and “no” (the “no,” however, does not open a door for supernatural intervention!).

Considering what we know today about the evolution of *Homo sapiens*, our evolution followed the laws that also brought forth other organisms. To survive climatic changes, for example, organisms must adapt to the new conditions. Roughly five to four million years ago the climate in north-east Africa became drier. As a result, open prairie advanced into previously forested regions. This reduced the territories apes were adapted to. As a consequence the number of ape species declined. One species, however, flourished. It was the species of apes that stood UP!⁴ Standing up freed the hands and made it possible to use them to gather food. Standing up was the adaptation that allowed these creatures (the *Australopithecines*: “Lucy”) to survive in the new environment.

The usage of the hands probably had an influence on the brain. Or, perhaps, brain capacity increased first allowing increasing sophistication in the usage of the hands. We don’t really know. What we *do* know is that about one million years later brain-size had just about doubled. Most likely as a consequence of this event, the new hominids (*Homo habilis*) were capable of inventing stone tools. This was an enormous break-through in human evolution. Stone tools made it possible to again increase the availability of food, especially meat, through more efficient butchering of game.

The availability of food is a crucial parameter in animal evolution because it provides the energy that makes

evolution possible. If there is different food in abundance, evolution produces different species from an original species. These new species become specialized for the gathering of particular food types. Biologists call this phenomenon “adaptive radiation.” Charles Darwin discovered the now famous radiation of one species of mocking birds into the many new species on the Galapagos archipelago. Another example is provided by the dozens of new species of lemurs that radiated from an original species on the island of Madagascar.

There was adaptive radiation in human evolution too. Over the period of about one to three million years ago, a variety of hominid species shared the territories of northeast Africa and later emigrated to Asia and Europe. One can only speculate why most hominids disappeared. Competition for resources or interbreeding might have contributed to their extinction. Nobody I know claims, however, that there was any supernatural intervention that favored us over the Neandertals! Human evolution is the result of natural law, including the laws of probability and chance. There is no anthropic principle in nature forcing evolution to bring forth *Homo sapiens*!

Evolution, however, *does* increase complexity. Again, the process is essentially probabilistic, there is no predetermined goal, no final cause that guides the process from beginning to end. Rather, complexification happens through unpredictable sequences of events that create history. Complexity will necessarily increase (even after catastrophes and disasters) but the path the process will take is undetermined. The reason is that the time of the future is essentially different from the time of the past: the past is closed yet the future is open. This is the reason why the future cannot be extrapolated from the past.

The nature of the creative process unites predictability that complexity will increase with the unpredictability of the pathway complexification will take. The pathways of evolution and human history are unpredictable not only because of the limited power of our mind. Human history and the history of nature are unpredictable because their trajectories *are essentially* indeterminate. To give an example from the realm of physics: if energy flows into a relatively unorganized (chaotic) system of a forming hurricane, it can increase complexity through self-organization. A hurricane may develop over warm waters that provide the energy to organize itself. A hurricane is a system that uses energy and in this way is capable of unifying elements into an overall system. The integrated elements (water molecules, air, wind, turbulence) form a system that is more complex than the unorganized elements. The system is capable of self-organization thanks to the influx of energy.

Systems capable of taking up energy are “open systems.” Open systems dissipate energy and are therefore called dissipative systems. Organisms are dissipative systems. They are far from a merely random organization of their parts and elements (far from equilibrium) thanks to the energy that flows into them. This is why organisms are capable of evolving. Genetic complexity can increase because there is energy available to support the process. The energy that drives the evolution of the universe originated in the original explosion of the Big-Bang. Thanks to this energy the universe expands, the galaxies and stars are shining, including our sun that drives the evolution of dissipative systems on earth.

That the process of evolution will generate increasingly complex systems is predicable. The pathway of the process, however, is not! *Evolution therefore is not a teleological process* (in which the goal is already determined in the beginning) *but a teleomorphic process* (in which there is no predetermined goal but genuine history). The notion of a teleomorphic process integrates the predictability that complexity will increase with the unpredictability of how it will happen. If evolution drives towards increasing complexity, self-consciousness has to be expected. This is because the most complex complexity is the one that is conscious of itself. This is why we self-conscious human beings are not aliens but expected, “At Home in the Universe.”⁶

Towards Updating The Christian Theology Of Nature

Some history

In the wake of Thomas Aquinas’ great synthesis of Aristotelian thought with Christian theology, creation existed thanks to the forms that God had united with matter.

As I understand Thomas, these existence-giving forms had their origin in the mind of God. Creation, therefore was God's work, accomplished and complete. God had created all possible substances because in his goodness, God did not withhold existence from anything that could exist. As a consequence, creation was essentially static, finished and complete the way God had created it.

The French philosopher and mathematician René Descartes challenged this view of the world. In his essay titled: "The World and Treatise on Man" (written during the years 1629-33, but only published in 1664 because of the Roman Inquisition and its condemnation of Galileo), Descartes writes: "For it follows of necessity, from the mere fact that he (God) continues thus to preserve it (namely nature, that is matter itself) that there must be many changes in its parts which cannot, it seems to me, properly be attributed to the actions of God, because he never changes, and which therefore I attribute to nature. The rules by which these changes take place I call the "laws of nature."⁷

Descartes takes up the Aristotelian/Thomistic understanding of God as the unmoved mover but gives it a new twist. There is a beginning of creation in which God gives movement to chaos. The resulting vortices of matter, together with the God-given laws of nature, allow creation to become itself. In contrast to the previous rather static understanding of creation, Descartes' matter in movement generates the world dynamically. For him, the development of the world is a process. The world becomes what it is now through matter in motion, through junks of matter colliding and obeying the laws of nature given by God. According to Descartes, creation could become itself because God had created it that way. The significant difference to the static world-view was that time, and therefore change, provided the basis for a developmental, dynamic understanding of the world.

Descartes' self-arranging matter could only bring forth machines. He therefore declared animals to be sophisticated machines and included the human body in this notion. The human mind was God-given, not a result of matter arranged by natural law. The strict separation of matter and mind, that God had created independently from one another, was the basis for Descartes' dualism.

The German mathematician, philosopher and theologian Gottfried Wilhelm Leibniz, tried to overcome this dualistic view of the world. He profoundly agreed with Descartes that the world had developed over time but not from matter but rather from psychophysical units. Leibniz called these "mental atoms" monads. According to Leibniz it was the sequential unification of monads that brought forth the world. Because monads were spiritual units "matter" and mind were not mutually exclusive. God the supreme monad, however, had brought all unities into harmony. For Leibniz, creation realized over time all the possible unities (monads) that God had conceived in the beginning of the world. In his view, the world was on its way of realizing increasingly perfect unities already conceived by the Creator. The reason was that human history was moving on the path of increasing perfection, namely moving ever more closer to God, the highest and most perfect monad. Leibniz' view was an optimistic view of world history. It was based on the conviction that God had oriented the trajectory of creation towards progress. Leibniz overcame the dualistic Cartesian world-view while keeping Descartes' dynamic understanding of creation. On the one hand, he provided a powerful argument for philosophers and theologians that creation was realizing the providential plan of God. On the other hand, however, his understanding of creation made it unnecessary for God to be actively involved in creation. The world was on automatic pilot that had been programmed by God. There was no way the world could deviate from this God-given trajectory. According to Descartes and Leibniz, God had created creation in such a way that it would realize his providential plan over time all by itself. As a consequence of this view, God became the distant creator, no longer involved in creation. Deism, including Christian deism, locked the creator out of creation.

As I see it, modern process philosophy/theology is a reaction to a deistic understanding of creation. Process thought is an effort to bring God back into the process that creates the world.

Process theology

In contrast to the understanding of the world as being capable of running by itself, process philosophy/theology understands God to be involved in the process of creation. The problem is where, when, and how?

The analogy frequently used to provide an answer to these questions is to compare the involvement of God in creation with the way the human mind is present in the body. Similar to the way the human body is (at least partially) under the guidance of the human mind, God is (more or less) guiding the creative process of nature. (For variations on this Whitehead/Hartshorn/Peacock theme and references see: Russell, 1993⁸).

One fundamental problem for process thought is why modern science cannot demonstrate that God *is* involved in evolution. Recently, the theologian Niels Gregersen suggested a solution to this problem.⁹ According to Gregersen, God “...not only sustains the world in general but also influences particular processes by changing the overall probability pattern of evolving systems.” Gregersen’s thesis is that: “God is creative by supporting and stimulating autopoietic (self-organizing) processes” (my parenthesis). Furthermore he writes: “*We might say that the blessing of God is a structuring principle, at once transcendent in its origination and immanent in its efficiency*” ... “God creates by *letting be*” (original italic) “by letting the world come into existence and thereby also leaving room for a self-development of nature.” Gregersen further suggests that “...the distributions of chance are not arbitrary but are depending on God’s initial setting. By letting the world into being as a self organizing and even *sometimes* self-reproductive world (my italic), God is continuously upholding the self-productive capacities of matter from its simple to most complex form.” Gregersen sees God as *reshaping the possibilities, as history goes along, by acting in different ways in different contexts...* (original italic), “...the dice are not only loaded once and for all but also “*differently re-loaded in the continuation of evolutionary history*” (original italic).” ... “As creator of the self-evolving world, then God is continuously acting *amorally* (since randomization occurs with no distinction between good and evil) but God is not acting *immorally*, i.e. with an evil intent” (original italic). “.... God may change the constraints themselves at many different levels...” and “... probability pathways are raised for some pathways rather than for others.” “Thus, from a scientific perspective God apparently does nothing!” Yet, “... the creative reconfiguration of nature by God takes on a thoroughly temporal or processual character.” ... “God is the creator of the fixed laws of elementary physics, an unnegotiable position.”

Gregersen’s answer why science cannot find God’s creative actions in the world: It is because God generates a bias in systems that follow the laws governing chance. God every so often changes the parameters of evolving self-organizing systems. God “fixes” the process of evolution but his actions are hidden by the fog of distributions of possible outcomes and statistics.

As a scientist I have to reject such a view. Gregersen’s model of how the creator interacts with creation does not take the methods and results of science seriously. If God directs evolution by throwing loaded dice, scientists cannot really understand how nature works, their life, efforts, and insights become meaningless. On the background of the accomplishments of modern science the suggestion that God is tampering with cosmic evolution is absurd. In my view Einstein was right: “God does not play dice.”

For Orthodox Christianity there are fundamental problems with process theology including Gregersen’s views. The freedom of God becomes questionable because he (the mind) becomes vulnerable through what happens in the world (body). In addition, process theology affirms that God is guiding the creative process from within creation. If this is so, why does God not steer history around the Holocaust, the genocides in Bosnia, Rwanda, Cambodia, or East Timor? How can the actions of God within creation remain morally neutral (a-moral) if the outcome leads to perversity, torture and genocide? Is God perhaps powerless to prevent disasters in His creation?

Because of the grim reality of evil, process thought calls the omnipotence of God into question. This is in sharp contrast to the belief of Orthodox Christianity, formulated in the Nicene Creed. Christianity believes in God the Father, the Almighty, not in a creator whose freedom is restrained by the history of the world. Orthodox

Christianity also believes in God the Father who passionately loves the world, not in a God that acts amorally in the world. The providential plan of God is to save creation through the death and resurrection of His Son Jesus Christ not by structuring the process of evolution. Process theology sees salvation as the (perhaps possible) outcome of world history, not accomplished for all times through the Son of God crucified.

Christians need to heed St. Paul's warning when he writes: "When I came to you, brothers, proclaiming the mystery of God, I did not come with sublimity of words or wisdom. For I resolved to know nothing while I was with you except Christ, and him crucified ... so that your faith might rest not on human wisdom but on the power of God" (1 Cor. 2: 1-3, 5). Because the cross of Christ is irrelevant to process theology I cannot see how to harmonize process thought with the Orthodox Christian belief formulated in the Nicene Creed.

To update the Christian Doctrine of Creation, universal evolution by natural law, not by supernatural intervention, has to be taken seriously. On the other hand, Orthodox Christianity believes that God creates and saves the world not through evolution but out of love, through His son Jesus Christ. As I see it, an updated Christian Doctrine of Creation must be anchored in the scientific discovery that nature is capable of creating itself, and in the fundamental dogma of Christianity that God is love.

How can God's plan to save creation become reality within creation, if creation is capable of creating itself? How can the plan of God to save creation become realized in creation that becomes itself through the history that belongs to the world? There is the wondrous example of how this is possible. It is the passion of Christ that clearly demonstrates how the plan of God fulfills itself perfectly, yet through the freedom of action of all involved. Everyone, Judas, the people, the High Priest, Pilate, are acting freely. Yet through the free actions of all involved, the saving plan of God becomes precisely executed. This is the key: for us human beings, determination (predestination!) and freedom, are mutually exclusive. For God almighty they are not. We need to keep this in mind when we wonder how it is possible that nature can become itself according to its own laws, yet in doing so fulfills God's plan. For God almighty this is possible because God eternal is not limited by time. It is through the history that belongs to creation that it can become itself in freedom. Eternity not only surrounds time but is in time, yet without crushing time. Nature and human beings act according to their own laws and interests yet, by doing so, they fulfill God's plan. Time belongs to creation because time is the gift of God to creation. It is the gift of existing as the "otherness of eternity."

The light that shines from the passion of Christ illuminates how the history of nature and human history are not made impossible by an overriding plan of God. God almighty is so powerful that what he has determined to happen from eternity, will happen through the indeterminate history of time.

The Word of God in creation

The Word of God that is God, creates creation. The Word of God does not bring forth God but the absolute "otherness" of God, creation!

In the beginning was the Word, and the Word was with God, and the Word was God. He was in the beginning with God. All things came to be through him and without him nothing came to be" (Jn. 1; 1-3).

"He is the image of the invisible God, the firstborn of all creation. For in him were created all things in heaven and on earth," "all things were created through him and for him. He is before all things" (Col. 1; 15-17).

This is another side of the incomprehensibility of the almightiness of God. God can bring forth through his Word what is essentially not God. It is the Word of God that creates. Yet It gives existence to the otherness of God. It gives existence to the world. The existence of creation is rooted in what creation is not, namely God. God who *is* (absolute) existence gives existence away to what *is not* existence, namely pure nothing. God creates creation out of nothingness. It is this "being created out of nothing" that makes creation essentially

“other,” totally different from God who is existence. Yet creation out of nothing is through the Word of God that *is* God! Therefore, the Word of God departs from God. It abandons its absolute existence into the abyss of nothingness so that creation can be! Plato was right: God is love! The world exists because the loving God wanted to share existence with what is not God. In his goodness God wanted to give existence away -- freely! This is why he created the world. He created the world as a gift to the world. This gift is his love given away. The gift of God is concrete: it is his beloved Son, the Word of God, that God gives to the world. This gift through which the world receives its existence belongs to the world. The Word of God is a gift really given to the world no strings attached! It is thanks to this gift that the world is capable of becoming itself.

There is an analogy that mirrors the creative act of God. It is when parents are blessed with children. The greatest parental joy is to see their children become themselves, growing into persons free to love. It is in this analogous way that the loving God lets the world become itself so that, perhaps, love might be returned! This is the center of Christianity, nothing more, but also nothing less. At the center of Christianity is not morality or even religion, but a love affair!

From the center of Christianity, the light of faith illuminates why nature has to be free to become itself. The reason is that without freedom, there cannot be love. From this perspective, it becomes obvious that creation *must* bring forth creatures that are free to accept or reject the love of God. This *must*, however, is a must that is free. It is the “must” of the providential plan of God for creation. Creation, however, realizes this plan freely according to nature’s laws, not supernatural guidance. It is in the light that shines from this center that Christianity can meet modern science. Both agree that there is no teleology in nature.

How the Word of God that *is* God can also be the origin of what essentially *is not* God but creation, is incomprehensible. It is the mystery of Christmas, the mystery of God incarnate, the mystery of the Word of God that is God and remains God, yet in the otherness of a true human being. God incarnate, God with us, one of us, God and Man in the oneness of the GodMan Jesus Christ. Christmas is the appearance of the Word of God from within creation. It is in Christ that the eternal God becomes reality within the history of the world. It is here where eternity intersects with time. It is through Christ that the eternal plan of God for creation becomes visible. Almighty God intervenes in the history of creation through the life, death, and resurrection of His son Jesus Christ. The revelation of God in Jesus Christ is the appearance of the love of God eternal within history.

Hans Urs von Balthasar writes: “When faced with the majestic absolute love, which in revealing itself comes to meet man, brings him back, invites him in and raises him to inconceivable intimacy, it begins to dawn on man’s finite spirit what is really meant by saying that God is the totally other.”¹⁰ The ultimate proof that God is love is God dying for creation on the cross. The almightiness of God does not exclude being capable of giving himself up into death. No one can understand this love. “What God has done for man is “understandable” only in so far as it is not understandable.”¹¹

At the center of Christianity is the invitation to freely enter into a relationship with God. It is through this relationship of God with his people that he acts in human history. God is not altering the course of history by interfering with the laws of sociology and politics, but by the actions of human beings obedient to do the will of God. God does not change the course of history by crushing freedom. He sends messengers to appeal to people that are free to convert. Conversion of the people to do God’s will is not a consequence of the historical process but of individual change of heart. We can see this in the lives of the prophets: they usually fall victims to the forces of world history. Jesus Christ, God appearing within history, provides the clearest example. Christ, the ultimate prophet, is committed to do the will of the Father facing the forces of history that destroy him. That precisely through this weakness against the forces of history the power of God rises triumphant within history, is the ultimate illustration of what it means to say that God eternal is almighty. Christ is the reason why we can hope against all hope. Father Brungs formulates this beautifully when he writes: “We believe that Jesus Christ is the Lord of history.... Time may not be on our side but eternity is -- so we believe.”¹²

In Jesus Christ the plan of God is realized for the past, the present, and the future because in God-Man, the Christ, eternity and time are one. The presence of salvation within time does not mean, however, that the world is not the world anymore. Salvation is within the world, offered to the world but does not destroy the freedom of the world. The ways of the world remain the same except that at each point in history, salvation is freely offered in Jesus Christ. In good times and bad ones, in every moment of each human life, salvation is real by accepting the grace of God to walk with Christ. It is by walking on His way that we human beings who represent the world are honored to contribute to its salvation too. "For creation waits with eager expectation the revelation of the children of God" (Rom. 8: 19). The children of God are not taken out of this world but sent into the world. Whatever happens to them, "We know that all things work for good for those who love God..." (Rom. 8: 28). The mission does not exclude the experience of evil, but it includes the promise that "God will wipe every tear from our eyes" (Rev. 7: 17).

Conclusion

In order to update the Christian doctrine of creation theologians will have to integrate the main result of modern science. Science found that the universe has evolved from an original explosion, the Big-Bang. It is safe to say that the most fundamental law of nature is universal evolution. Evolution is not just the central phenomenon of life, it is also the way all the atoms in the periodic chart emerged. This insight from science that there is evolution in the organic and in the physical universe shows that evolution is the most fundamental law of nature. One surprising consequence of this finding is that the various laws of nature, such as gravity or electromagnetism, are a result of evolution too. Universal evolution therefore is not the result of laws given to nature by God. Evolution occurs according to the laws of nature, not supernature. To this the theologian will add: "Nature can do that because God created it this way!" God created creation in such a way that it is capable of creating itself. It is because of the limitations imposed by language that we must use the same verb for God and creation. God "creates" creation out of nothing -- creation cannot create itself this way. Nature is capable of creating itself out of energy, not out of nothing. That nature can create itself this way is the gift of existence to nature. This gift given by the creator to creation is the creative power to create its own existence. It is because of this gift of existence from the loving God to creation that it can become itself. That the Creator is capable of creating creation in this way is one aspect of our faith in God almighty.

The center of the Christian faith is the belief that God is love. From this center of Christian revelation it is obvious that creation has to be free to become itself. The bond of love between partners cannot be dictated, it must be accepted freely. Therefore, without freedom of human beings (who represent creation), a loving relationship with God who freely offers his love, would not be possible.

To find the rightful place for the history of the universe within Christian theology, a reflection on the relationship between time and eternity is necessary. Time is within eternity but not crushed by it. The world, therefore, is capable of becoming through its own history. For creation there is time, the past, the present, and the future. For God past, present, and future are united into the unity of his eternity.

When God eternal appears in history, salvation becomes concrete within time. Through the life, teaching, death, and resurrection of Jesus Christ, salvation is real for the past, the present, and the future. It is central for all times because the saving act of God is an action in eternity. It is only for us that this action is in the past. This is because we are historical beings, creatures in time. God, however, unifies all time into his eternity. Therefore, salvation is not a process that will become reality as a result of world history. Rather, salvation is ever present and accomplished on the cross and through the resurrection of Jesus Christ for all times. In him, God eternal creates and saves creation! It is by centering on Christ, not on process theology, that updating the Christian doctrine of creation must be accomplished.

For Christianity, the scientific discovery that nature is capable creating itself makes only explicit what is already implicated in its fundamental revelation, namely that God is love.

Endnotes

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