INTEGRATING EVOLUTION: A CONTRIBUTION TO THE CHRISTIAN DOCTRINE OF CREATION

by Rudolf B. Brun

Abstract. Science has demonstrated that the universe creates itself through its own history. This history is the result of a probabilistic process, not a deterministic execution of a plan. Science has also documented that human beings are a result of this universal, probabilistic process of general evolution. At first sight, these results seem to contradict Christian teaching. According to the Bible, history is essentially the history of salvation. Human beings therefore are not an "accident of nature" but special creations to be saved. With deeper theological probing, it becomes clearer, however, that creation must create itself. The Christian God is the loving God who enters into a loving relationship with human beings if they desire to reciprocate. If creation could not create itself, human beings could not be free. Without freedom to ignore or reject God's love, the central act of the Christian God, the drama of salvation, would become a parody played by marionettes in the hands of a supernatural manipulator. Christians should welcome the fundamental insight brought forth by science that the universe, including human beings, created itself through its own history. This article will try to show that this scientific insistence is required and confirmed by the intrinsic character of the orthodox, Judeo-Christian concept of God. That nature has to create itself, including human beings, secures human freedom and with it, the responsibility for human actions. From this perspective one might better understand the Bible in the light of God's revelation through the book of nature.

Keywords: Christian doctrine of Creation; Cosmogenesis; evolution; philosophy of evolution; theology of evolution.

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[*Zygon,* vol. 29, no. 3 (September 1994).]
 ISSN 0591-2385

The goal of this article is to suggest a way toward integrating evolution into an updated Christian doctrine of creation. The point of departure for this attempt will be Hegel's reflection on the Christian doctrine of the Trinitarian God. This reflection of the nature of God as "otherness" within God (Trinity) and "otherness" outside of God (nature) might provide the foundation for securing the relationship between the loving Christian God and God's creation.

For Hegel, the endpoint of creation, its purpose, is given from the beginning. This goal is the unification of God and creation in the God-Man Jesus Christ. The sequential transformations from the physical universe to life, and from there through higher and higher organisms are understood as steps of the ascending spirit. The spirit begins alienated from itself and moves toward becoming itself. Hegel understands cosmogenesis as sequential transformations of the spirit from lower into higher forms of life. Finally, the spirit finds itself at the level of the human mind, because at this level the spirit is capable of finding itself through reflecting on itself. For Hegel, it is the rising spirit that drives creation toward increased perfection. Hegel carefully studied the results that science produced in his time. His view found support in the work of Jean-Baptist Lamarck. In Lamarck's view, as well as in Hegel's philosophical system of nature, evolution was caused by a trend toward increased perfection.

The Hegel-Lamarckian position became undermined by Charles Darwin's discovery of the interplay between organismic variation and natural selection. The discovery of this mechanism of evolution explained how nature could evolve by natural law without any goal-oriented process toward increasing perfection.

Since Darwin's discovery of this natural driving force of evolution, the neo-Darwinian understanding of evolution as the result of the interplay between genetic variation (mutations) and natural selection has found overwhelming confirmation. Why then even bring up Hegel's old-fashioned view on cosmogenesis? It is because his theological point of departure, Hegel's understanding of nature as "otherness of God outside of God" (nothingness) is the Christian insight into the nature of creation as creation out of nothing *(creatio ex nihilo)*. The theological point of departure for Hegel's cosmology, therefore, is at the center of the Christian doctrine of creation. But what about the scientific dimension of Hegel's view? First and foremost, modern science has to reject the notion that cosmogenesis has a purpose, that it is goal-oriented toward the formation of human beings, for example. The fundamental reason for this rejection is the insight that cosmogenesis, including the emergence of human beings, is the result of a historical process. Universal evolution is

essentially a probabilistic, not a deterministic process. It is what actually happens among possible events that creates history. Any form of cosmic teleology negates genuine cosmic history. Teleology holds that what actually happens is the execution of a plan, or, what boils down to the same distortion, there is purpose in "history" because there is a goal to reach. Modern cosmology has made it abundantly clear that evolution is not a deterministic realization of a plan already given at the start. Nature is not like a train heading toward a predetermined destination. Rather, nature has the creative power to create itself through its own history. Part of this history is the emergence of human beings from the natural process. Science, therefore, has found that human beings are the result of the natural process of evolution capable of creating itself.

This is crucial because becoming itself through history is also the basis for human beings to become themselves! This freedom of human beings, this essential empowerment to become themselves through freedom of choice, fits the essence of the Christian message precisely: Without freedom, the relationship between God and humans cannot make sense. It cannot make sense because, without freedom, there cannot be love. Determinism by God contradicts the free reciprocity that characterizes the Christian theological understanding of love.

For this reason, the Russian philosopher and theologian Vladimir Solovyev (1851–1900) welcomed Darwin's discovery that organismic evolution was driven by the natural process of variation and selection. Solovyev saw the importance of nature creating itself. The way from Lamarck to Darwin led Solovyev to understand nature to be on the way toward freedom. Evolution is the safeguard of human freedom, the freedom to enter into a genuine relationship with the creator. Solovyev's view of nature underscores the importance of natural evolution as a self-creating, historic process that brings the essence of the Christian message into the center of creation.

Finally, I will try to integrate the insight that evolution does not execute a plan with the Christian message that God has a plan for his creation, namely to save it.

I. COSMOGENESIS

The Evolution of Matter. Over the last fifty years or so, scientists discovered that evolution, first documented in the organismic world, was also the fundamental process by which the inorganic world emerged. Nuclear physicists as well as astrophysicists succeeded in describing the origin of matter from the original Big Bang in

surprising detail (Weinberg 1977).[1] The basic mechanism driving this evolution is the synthesis of previously synthesized elements into new entities under appropriate environmental conditions (Fowler 1984, 922).[2] The bottom line is that synthesis brings forth novelty.

Chemical Evolution. The synthesis of molecules into compounds with new properties is the domain of chemistry. New substances emerge from the synthesis of elements under appropriate conditions. During the evolution of the universe, including the solar system with the early earth, extensive chemical evolution took place. Increasingly complex molecules were synthesized thanks to the availability of energy and suitable chemical environments. The new molecules generated new chemical niches. In some of these, the conditions became appropriate by chance, thereby providing new chemical environments in which more complex compounds could emerge.[3]

A central aspect of evolution at all levels of organization is that complexity of systems can increase as long as there is energy flowing into such systems. Systems that are capable of taking up matter or energy are open systems capable of forming spontaneous patterns. There is plenty of energy from the original Big Bang, for example, in the materials and radiations of the stars, including our sun, to drive morphogenesis in such open systems. There are mathematically defined states in which such systems are stable (Prigogine 1980, 89, 106, 128; Brooks and Wiley 1986, 77).

A given dynamical system might take up matter or energy to the point of instability. If there is enough energy available, the system will "jump" from its prior stage to a new stable state. The generation of new atoms from old ones, as well as the synthesis of new chemical compounds from simpler molecules, are examples of such morphogenetic events.

Biological Evolution. Chemistry demonstrates that the generation of new molecules by synthesis from already synthesized ones is practically without limits. The chemical processes that occurred during the history of our planet led to the formation of increasingly complex compounds ultimately resulting in the synthesis of self-replicating molecules (see Engel, Macko, and Silfer 1990, 47; Hanawalt 1980; Graham 1972, 257). These self-replicating molecules, most likely RNA,[4] probably became encapsulated into vesicles. Bilayered vesicles (miscelles) that can catalyze their own replication were recently described (Bachmann et al. 1992; see also

Cairns-Smith 1982). The details of how life originated need to be worked out, but there can be no doubt that life emerged as a result of general evolution. Very likely, a multistep process produced cells by integrating other organic entities (Margulis 1984, 75). The appearance of life was again a qualitative jump analogous to those resulting from the synthesis of subatomic particles into atoms or the synthesis of atoms into molecules.

Organismic evolution continued with the aggregation of cells. The cells in such aggregates were most likely capable of executing all living functions, but in a colony this was no longer necessary. The cells on the outside, for example, were able to save energy by turning off the "inside" functions and vice versa. Task-sharing, or differentiation, in such aggregates probably happened by suppression of specific functions. This resulted in increased energy efficiency and provided regeneration capacities to the aggregates. For example, if "outside" cells were lost, "inside" cells were capable of replacing them by turning on previously dormant "outside" functions.

In a next synthetic step, the cellular aggregates associated with one another. This created primitive organisms consisting of a series of identical segments. Originally, each segment was probably again capable of executing all of the functions necessary for its survival as a unit. By associating with one another, the segments were again able to save energy by turning off functions. For example, those segments located anteriorly did not need to express posterior functions anymore. In this way, perhaps, antero-posterior polarization of such wormlike organisms might have occurred. Because this synthetic arrangement improved energy efficiency, the population could increase in number. This in turn made it possible for these creatures to expand into new habitats.

It is important to see that the synthetic event, namely increased energy efficiency in this case obtained through aggregation, happened first. Only after this event were these organisms capable of increasing their number. The point is that an endogenous synthetic event has to happen before natural selection can enter into action. The creative event occurs endogenously and emerges from within the already existing system. Natural selection then may (or may not) act upon the new invention, fine-tuning adaptation by favoring efficient reproduction. To acknowledge the central importance of emergence for evolution does not introduce any vitalistic or supernatural force into evolution. "Emergentism is a thoroughly materialistic philosophy" (Mayr 1982, 63).[5] Throughout evolution the emergence of novelty, invention, takes priority over natural selection.[6]

Since the beginning of the twentieth century, it has become

increasingly clear that mutations, spontaneous changes in the genome, are the basis of inheritable organismic variations. It is also evident that mutations occur with certain frequencies. Mutation rates depend on many factors. There are exogenous factors, such as mutagenic chemicals, irradiation, and perhaps viruses. There are also endogenous factors, such as spontaneous mutations related to the chemistry and the internal organization of the genetic material (DNA). The evolution of higher organisms from lower forms of life depended on genetic change. Could the genome be subjected to integrative, synthetic processes analogous to the ones discussed so far? If this were indeed the case, multiplying, first identical genes would have formed genetic aggregates. In such gene clusters, one functional gene would have been sufficient to maintain the original function. The rest of the genes in the cluster could mutate without jeopardizing necessary gene functions. The result of these mutations in redundant genes would have been the generation of genetic diversity within an originally identical gene cluster: a family of genes might have formed (Ohno 1970, 32; Raff and Raff 1985, 203). In a changing environment, for example of fluctuating water temperatures or varying water salinity, a gene within that family but different from the original one might have functioned more efficiently than the gene from which it originated. This genetic variation caused by mutations helped the organism to survive in a new environment. The individuals that had these genes had a selective advantage over the ones that did not possess them. The synthetic process operating at the genetic level would have continued by producing identical gene families. These families subsequently diversified by various types of mutations and, in a third step, their new functions became integrated into the genome.

Integration of diversity leads to the emergence of novelty. In the case of organisms, integration of genetic diversity leads to the formation of new genetic units (genotypes). Such new genomes will allow the formation of new organisms (phenotypes). Obviously, these creatures will only be able to survive if they occupy a niche in which they are able to reproduce in sufficient numbers. Again, natural selection is a crucial but secondary factor. The primary event is innovation. Innovation is the fundamental phenomenon of cosmogenesis. In physical as well as organismic evolution, it is synthesis that creates novelty. Mutations are of crucial importance in organismic evolution, but they happen in the context of a genome that already exists. A new mutation may not have a crucial effect on an organism because a genetic change happened but because that change occurred in the context of an already existing genetic

network. To say that mutations and selection cause speciation is reductionist language because the importance of the genetic context in which mutations have their effects is ignored.[7] This is why I have difficulties with the formula "mutation and selection" for organismic evolution. This neo-Darwinian explanation overemphasizes the importance of natural selection and fails to recognize the phenomenon of emergence. This is why it cannot provide any insight into the physical evolution of the universe: Where there is no reproduction, Darwinian natural selection cannot work, yet there is still evolution. Emergence is the spontaneous appearance of novelty through an event integrating already existing elements into novelty. Emergence occurs in physical as well as in organismic evolution.

In organismic evolution, genes are the "already existing elements" that may form new genomes through integrative events. One reason why most biologists claim that the neo-Darwinian model of evolution is sufficient to explain speciation is that embryology, developmental genetics, has not yet been integrated into "The Great Synthesis." Neo-Darwinism is too heavily dependent upon data collected from populations of adult organisms. Adults cannot form new species: birds did not evolve from adult dinosaurs. Rather, the developmental programs that drive embryogenesis must have changed. Over the last ten years or so, developmental genetics has made splendid progress in understanding how genes interact with one another. It is the synergistic interplay of genes that generates the genetic programs that control embryogenesis. To understand how such programs evolved, however, is a matter of current research.[8] An improved understanding of how mutations in regulatory genes bring forth new embryonic programs will bring the phenomenon of emergence into focus. It will then become obvious that emergence is the primary cause of organismic evolution, not natural selection. In this way, organic evolution would follow the same logic of the synthetic process already at work in preorganic evolution. The formula for evolution is not *mutation* and selection but *invention* and selection.[9]

Evolution of Conciousness and the "I." The original Big Bang explosion of the universe first created the various elements of matter. These particles of "frozen" energy interacted with one another and formed the first "simple" atoms of hydrogen and helium. Out of these, all of the different atoms listed in the periodic chart were synthesized in the various nuclear furnaces of stars. As stars exploded, the synthesized atoms were spewed out into space, where they formed gigantic clouds of dust. In these clouds, the atoms could interact with one another to form surprisingly complex molecules.

Under the influence of gravity, these dust clouds collapsed to form new stars. Our sun is a star born in this way. Dust from the original cloud, still circling the forming sun, aggregated to form planetesimals. As these collided with one another, the planets formed. On earth, the presence of abundant water allowed the molecules inherited from space to interact with one another in increasingly complex ways. The energy required for the chemical evolution was provided, at least in part, by the heat generated in the inner parts of the earth and partially by the sun. The evolving organic matter passed through the integration of more and more complex molecules to the synthesis of life.

Analogous to the increase in chemical complexity, the various forms of life also became more and more complex. Evolution greatly increased the complexity of life along often precarious, odd, and convoluted paths. Increasing complexity, that is, more efficient integration of diverse organismic structures, led to increased skills to solve problems. One result of complexification in organismic evolution was the emergence of nervous systems. These systems allowed better and better extraction of the energy available in the environment. Thanks to evolving patterns of behavior, organisms could first find favorable niches in the environment and later build such niches. The nests of birds or beaver dens are examples of this process. The capability of organisms to act on their surroundings demonstrates that they can distinguish between themselves and the environment in which they live. Purposeful behavior, organized action to reach a goal, is the sign of consciousness and indicates the level of organismic complexity.

We do not know how consciousness made the "quantum jump" into self-consciousness in human beings. The logic of the evolutionary process would suggest, however, that fundamental psychic elements came to us from our apelike ancestors. It took only about 4 million years for these creatures (most likely *Australopithecus afarensis*) to evolve into modern human beings (Johanson et al. 1987, 205). Fascinating, touching, and frightening accounts relating to this likely scenario can be found in Jane Goodall's book on chimpanzees (Goodall 1986, 136). They seem so very close to us not only in their affections but also in the wars they fight! The point is that the elements that are integrated into our psyche were synthesized at prehuman levels. From this perspective, the architecture of the human psyche depends on the proper integration of psychic elements at multiple levels. The archetypes discovered and described by C. G. Jung might serve as an example of the importance of unification of psychic entities. Self-consciousness and the appearance of the "I"

was the last and highest level reached by the synthetic process of natural evolution. "Thinking existed long before man was able to say: I am conscious of thinking" (Jung [1939] 1968, 280). "The personality of the 'I' depends on the integration of the entire psychic structure" (Jung [1939] 1968, 289).

Philosophy of Evolution. The advancement of scientific knowledge and its impact on our understanding of the universe demonstrates that the methods of science are practical modes of philosophy. It is a great accomplishment by science to demonstrate, for example, that the universe did not originate from matter nor from spirit, but from energy. Science further shows that energy not only "froze" into matter, but that it is also the fundamental agent of cosmic development: without energy there is no morphogenesis.

In this view, there is only one universal, creative process at work in physical as well as organismic evolution. This process is creative through the integration of diversity into new units. These emerging units might at first be identical but then diversify. Diversification is a result of the fundamental temporo-spatial nature of the universe. Newly synthesized identical entities will have to occupy niches that cannot be identical anywhere, anytime. Because the emerging new units become part of the different niches they occupy, their modes ("colors") become different from one another. On the level of the evolving matter, this creates differences in the same type of units, polarities necessary for the synthesis of novelty at the next level of complexity.

Complexity that emerges from synthesis unifies diversity. Although the diversity of the integrated elements still exists, the emerging new unity is one. This integrated oneness is unified diversity, simple complexity. Inasmuch as units of integrated complexity are also simple, they can serve as elements for a still more complex unity that might emerge from them in a next synthetic step. The process continues by the synthesis of more and more complex unities from which still more complex entities emerged by synthesis. In my opinion, it is justified to call these increasingly complex levels "higher" levels. The terms "lower" and "higher" express the intensity of synthesis. The more different, contrasting elements a unity integrates, the higher that unity is (Ehrenfels [1890] 1960, 44).

The nature of the universal process of evolution results in a discontinuous and hierarchical organization of reality. The process is discontinuous because each synthetic step creates a new level of reality in a "quantum" jump. The morphogenetic process also creates hierarchy because a synthetic unity orchestrates the activities

of its elements. The synthetic unity that emerges in the "I" is perhaps the most powerful example to illustrate this hierarchical "top-down" regulation.

The view that novelty emerges from synthetic events also reveals the basic importance of history because the new cannot be pulled out from the past. History cannot be an extrapolation from the past because the present emerges as genuine novelty from synthetic events. This also explains why knowing all of the parameters of the present will not allow one to predict the future, as Laplace claimed. It is the great accomplishment of Henri Bergson ([1907] 1944) to have seen this deterministic fallacy. In his book, *Creative Evolution,* he showed that the time of the future is not an extrapolation from the time of the past. The future is open—what happens is historical in nature, not an unfolding or a realization of the parameters of the past. In other words, cosmogenesis is essentially a historical process. Therefore, evolution cannot be goal-oriented, it cannot be the realization of a blueprint somehow present at the beginning of creation. What actually happens during this history of the cosmos at any one instant is the realization of one event out of an entire horizon of other possible events. The realization of actual events is probabilistic and historic, not deterministic or teleological in nature. Put bluntly, from the perspective of the natural sciences, evolution does not execute a plan to bring forth human beings. I enthusiastically agree with the biologist Stephen J. Gould when he writes: "*Homo sapiens,* I fear, is a thing so small in a vast universe, a wildly improbable evolutionary event well within the realm of contingency. Make of such a conclusion what you will. Some find the prospect depressing; I have always regarded it as exhilarating, and a source of both freedom and consequent moral responsibility" (Gould 1989, 291).

II. Evolution and the Christian Doctrine of Creation

The fundamental revelation of Christianity is that God is love. God created the world out of love, became human, suffered, died, and rose again so that we might share eternal life (and creation with us). Implicit in this message is that it is universal as well as absolute. Christian theology holds that salvation in Jesus Christ is not relative, limited to one or another epoch only, but rather relevant for all times. This view implies that it can be made believable again and again, to all human beings, in spite of changing worldviews. Human beings are different from all other creatures in that they are capable of

rational thought. Therefore, one test that religious affirmations must pass is that they have to be reasonable to believe throughout history, including our time. The task is to translate these affirmations into the various human cultures and epochs, so that the central point, namely that God is love, remains believable.

This was the task that Hegel faced. During his lifetime the evidence was fast accumulating that plants and animals had drastically changed over time and therefore could not have been created in one single act. Hegel closely followed the significant developments in the systematics of animals, for example, the way in which Jean-Baptiste de Lamarck in France ranked animals (see Hegel [1841] 1964, 9: 693–96) It became obvious to Lamarck that higher organisms had somehow developed from less perfect, lower ones. "Under increasing perfection Lamarck understood the gradual increase in 'animality' from the simplest animals to those with the most complex organization, culminating in man" (Mayr 1982, 345).

For Hegel, this must have been an exciting confirmation of the suggestion made by Leibniz that nature was driving toward increased perfection.[10] Hegel defined nature as the absolute Idea (God) in total difference or "otherness." Hegel writes: "God has two revelations, as nature and as spirit, and both manifestations are temples which He fills, and in which He is present. God as an abstraction is not the true God; His truth is the positing of his other, the living process, the world, which is His Son when comprehended in its divine form" (Hegel [1827] 1970, 204). God is not limited by "otherness." "Otherness" within God is the Son, united with the Father in the Holy Spirit. "Otherness" outside of God is nature, creation. Nature is the Son of God, not as Son however, but as abiding "otherness" (Hegel [1827] 1970, 206). Within God, the Spirit is by itself through the Father and the Son. Outside of God, the spirit is outside of itself. In this mode of "otherness," the spirit is the farthest away from being itself because it is not by itself. This sets the creative process in motion through which the spirit transmutates from level to level until it comes to itself, comes to possess itself in the freedom of humankind. The fulfillment of this freedom is to be able to respond to God's love freely, not forced in any way. Ultimately, the true love of God for humanity and the genuine loving response of humankind to God becomes real in Jesus Christ. He is as the Son of Man, the Son of God (Hegel [1809/1811] 1961, 3:226; [1845] 1965, 19:132–34). As the New Adam, Christ shows the face of God in human form. The image of God becomes (again) visible in him. This image is not just a picture of God, but

the appearance of God *(imago Dei)* in the "otherness" of humans. On the face of this image, the "otherness" of God appears as all that is created, all that is not God, thanks to God. This is how Hegel sees the relationship between God and the creation. It is the relationship of love, in which "otherness" provides the polarity that is encouraged, enjoyed, and celebrated.

The passage just cited from Hegel: "His truth is the positing of his other, the living process, the world," might be a misleading choice of terms. Hegel does not understand "process" mechanistically, in the sense of a process that executes the creator's plan. This is why he refers to this process from which the world originates as "the living process." According to Hegel, nature, that is creation, is the "otherness" of God outside of God. Within God, "otherness" is the Son (of God). Outside of God, "otherness" is nature, the Son of God outside of God, namely Jesus Christ, God and Man in the unity of one person. This unity is neither reduction of Christ's humanity into God, nor the disintegration of the Son of God into the Son of Man. Rather, it is the ultimate unity in the difference, the Son of God and the Son of Man, the affirmation of the total diversity of both, yet in genuine unity. The point is that nature is not God, but the "otherness" of God. God that is God, but outside of God. In this way nature can be itself.

This understanding of the nature of nature is anchored in various passages of the New Testament, for example in Saint Paul's letter to the Corinthians (1 Cor. 8:6), to the Colossians (Col. 1:16–17), Hebrews (Heb. 1:2) and especially in the prologue to the Gospel of Saint John (John 1:1–3). "In the beginning was the Word and the Word was with God, and the Word was God" (the expression of God within God, the Son). He was in the beginning with God. All things (creation) came to be through him, and without him nothing came to be. What came to be through him was life."

This brings us back to Hegel's understanding of creation as "living process" that creates the world. It is the unity of the spirit that assures that nature can be one, can become what it is, namely, a unity that through the living process will ultimately become itself, possess itself, so that it can be free. It is "otherness" of God outside of God that through the living (not mechanical) process becomes itself. The ultimate difference between God and nature expressed as "otherness" cannot provide any ground for God to become, to develop together with the world. For Hegel, nature is not part of God, or God part of nature. Nature is the "otherness" of God outside of God.

Outside of God there is not anything, no eternal matter, no chaos, only nothing. There is nothing because pure being is pure abstrac-

tion, the absolute negative, which is nothing. What is, has already passed over into nothing, and nothing into being. This vanishing into its opposite is the essence of becoming. Becoming is the movement in which both (pure being and pure nothing) vanish into their opposite. Their truth is the movement of the immediate vanishing of the one in the other. Becoming is the movement in which pure being and pure nothing are distinguished, but by a difference, which has equally immediately resolved itself (Hegel [1812] 1969, 82–83).

Hegel's reflection on the nature of pure being (namely, that it is nothing) integrates another essential Christian understanding of creation—that God created the world out of nothing.[11] "In the beginning God created Heaven and Earth." This first point in the Apostoles' Creed makes it impossible to ponder the problem of creation outside this fundamental revelation, namely, that God is independent from his creation but not vice versa (Barth [1958] 1977, 3). The point is that the Christian God is not in a process of becoming. The world is not a pantheistic God, nor is creation part of a panentheistic creator. Hegel's notion of nature as the "otherness" of God outside of God does not deify nature, nor does the divine become part of the process of creation. Both misunderstandings originate because "otherness" is reduced to "sameness in difference" and not left as (radical) "otherness" as the abyss between God and his creation that only the Almighty God can bridge in Jesus Christ.

For Christians, there can be no doubt that God created the universe: Holy Scripture begins with this bold statement. It is not an accident that this is the first sentence in the Bible: All that follows is based on the acceptance of this basic relationship between God and his creation. The sentence can leave no doubt in the reader's mind that God existed "before" and independently from his creation. God is God without creation. God is not less God because creation was not, nor does God need creation to become God. The revelation of God's plan of salvation that unfolds from this first sentence in the Bible on to the death and resurrection of Jesus Christ is anchored in the freedom of God to act. This freedom is absolute, not restricted by whether creation is or is not. The perspective from process theology, that God depends on the creation, in any way becomes together with the world, is not the Hegelian view. Hegel's philosophy of nature is firmly rooted in the fundamental Christian revelation that God is independent of the world, is the free, omnipotent, the supreme being that creates creation not out of any necessity or constraints, but out of love.

The love of God appears in history in the person of Jesus Christ, the Savior of the world. Christians know that God has a plan for his creation, namely, to save it through the death and resurrection of Jesus Christ. Christ is the fulfillment and purpose not only of human history, but of the history of all creation.

Based on the fundamental Christian dogma that God is love, Hegel incorporated the science of his time into a philosophy of nature. In so doing, the history of nature, including the history of human beings, was understood as the realization of God's plan. In this way, the outcome of history was already given at the start. History became ahistoric because what happened was not really creative but mere actualizations of what had already been fixed. In Hegel's system, one might argue, there is no real history, only teleological reaching of the goal that was already given in the past.

This, however, is not the history of the ever-involved, ever-present, ever-creating, graceful and loving Christian God. Here we face the Christian paradox that God is involved in all cosmic and human history but in ways that do not prevent creation from becoming itself. On the one hand, God is intimately involved in his creation, is at the center of its becoming, yet lets creation, and with it human beings, become themselves in freedom. A shadow of God's nature falls on those who raise children: what a constant involvement in letting go!

This might well be the center of the problem for a current Christian doctrine of creation: How can creation create itself and still fulfill God's plan? In trying to answer this fundamental question, we are in danger of equating our human ways of planning with the way God acts. God does not impose plans on creation by intervening at "critical stages" of the process. God does not act in history by creating something first and then later introducing modifications. God creates not only "out of nothing" but also "without movement" (*ex nihilo, sine motu,* Thomas Aquinas, *Summa theologiae,* I, 45, 3). Therefore, God does not guide the natural creative process by imposing God's ways. Rather, by letting the natural process create itself freely, it precisely fulfills God's plan. Again, we at the center of Christian revelation that is clearly paradoxical for the human mind. Langdon Gilkey touches the heart of this matter when he writes: "He gives being, but not His own being; that He is eternal, and yet He founds and rules time; that He is infinite, absolute, unconditioned, and self-sufficient, and yet that He limits Himself by a dependent creature outside of Him; that He is in all as their ground, and yet over against all as their personal judge and savior; that He is good, and yet permits the existence of real evil. Each paradox cries for a

resolution; it seems to leave us with an intellectual conflict unsupportable by a rational mind" (Gilkey 1959, 280).

We can obtain a glimpse into the way God Almighty plans by pondering the actions of the persons involved in the history of Christ's passion. They are not marionettes in the hand of God—that would have been a thin and superficial plot indeed! Judas, Pilate, as well as the High Priest freely follow their own plans and are not captives of a scheme imposed by God. God the Almighty executes plans in ways that we cannot: God's plans are fulfilled through human beings acting freely. As they execute their plots, God's plan is fulfilled with ultimate precision.

God's plan of salvation is fulfilled through human beings acting freely. In analogous ways, so does creation fulfill God's will by creating itself freely by its own laws. Just as for the unbeliever, there is no saving plan that is realized in Christ's passion, so outside of faith, evolution does not fulfill any purpose. Thus, for science, there is no plan, no teleology, no goal toward which evolution works its way. The insight that there is a God who has a plan for the creation is given by faith, not natural history. Although there is this strong desire to see faith confirmed by science, Christians know that faith does not have its roots in science. Time and time again they have had to learn the lesson that nature is capable of creating itself. Time and time again faith had to withdraw from the entanglement with science because science had made progress and came to understand what previously had to be "explained by faith."[12] Christians will have to let go of this new unfaithfulness to faith, this attempt to justify faith by science. That creation has a purpose is a matter of true faith, not science. Faith comes to itself only in its own realm. It is the reality created through the experience of Christian life. Faith cannot become an integral part of a philosophical system because the freedom of the loving God and the freedom of the lovingly responding human beings cannot be locked into a system. Hegel's philosophy of nature limits the history of nature because it understands cosmogenesis as a process that is goal-oriented from the start. Proceeding toward a predetermined end, however, restricts the importance of historical events. History as the sequence of probabilistic, reality-creating events degenerates into a sequential execution of an already given schedule. I doubt whether Hegel understood the development of nature in this teleological way, but his philosophy of nature was frequently understood in this manner. Science has shown since Hegel that there is natural history but no natural teleology. This lesson learned from the book of nature illustrates that human beings are not the predetermined outcome of a plan but a historic, probabilistic,

creative event of nature. Philip Hefner is at the heart of the matter when he writes: "*Homo sapiens* is to be understood as part of nature's process, not only ecologically, but in terms of kinship with all that has appeared within the process of nature's evolution" (1992, 337). Thanks to the freedom of nature to create itself, human beings are free. The freedom of human beings and the freedom of nature to create itself cannot be limited in any way. Evolution is essential for the Christian doctrine of creation because it safeguards the freedom of human beings and the creation for which they stand (Rom. 8:18–24).

The Russian theologian and philosopher Vladimir Solovyev (1851–1900) may have been the first to see this.[13] He finds the point of departure for thinking over the relationship between God and Creation in contemplating the theological understanding of the relationship between Christ and the Church. The Church is born on Good Friday as Christ gives himself up for the Church by his death. In this mystical way, the Church becomes Christ's body in which all of the believers are members. The Church and Christ are one, but it is oneness in difference. It is the oneness of bridegroom and bride, true unity that is one in the difference. It is the oneness experienced by persons embracing one another, spouses united in the same spirit. This is the relationship between Christ and the Church, it is one that is inclusive of difference, for Christ is not the Church and the Church is not Christ, but they are one precisely in this difference.

How this can be is the mystery of love. In human love, we experience this structure of identity in the difference. In love between persons, the persons are always different, yet become one. Such is the loving relationship between Christ and his Church. It should also be the structure of the Universal Church. The Church, the bride of Christ, can only be one but again, a oneness in united diversity.[14] It is in this way that all human beings, with all their differences, can be this Church. It is thanks to this diversity of human beings united in the spirit of Christ that the Church is one. True unity is inclusive, not exclusive of diversity. And although there are limits to the integrative power of human love, there are no limits in unifying diversity for the love of God. It is with a confession of this omnipotent power of God's love that the Christian Creed begins: "We believe in one God, the Father, the Almighty . . ." (Solovyev [1889] 1948, 147).

Solovyev then reflects on what this means, namely to say that God is almighty. He writes:

God exists in Himself and by Himself. The reality He possesses is in the first place altogether from within; it is an absolute substance. So too the proper action or essential manifestation of God cannot be either determined or modified by any external cause, but is simply the pure and perfect (that is, completely adequate) reproduction of His own being, His unique substance. This reproduction cannot be either a new creation or a division of the divine substance; it cannot be created because it exists from all eternity, it cannot be divided because it is not a material thing, but pure actuality. God, possessing Himself, manifests it for Himself, and reproduces Himself in a purely interior act. By this act He arrives at the enjoyment of Himself, that is, of His absolute substance, not only as existing, but also as manifested. Thus the complete existence of God does not require Him to go outside Himself, nor does it set Him in any external relationship; it is perfect in itself, and does not involve the existence of anything outside itself. In the three constituent modes of His being, God is in unique relation to His own substance: (1) He possesses it in Himself, in His "first act" (absolute fact). (2) He possesses it in Himself, in manifesting or producing it from Himself in His "second act" (absolute action). (3) He possesses it in returning upon Himself, in rediscovering in it a "third act," the perfect unity of His being and His manifestation (absolute enjoyment). He cannot enjoy it without having manifested it, and He cannot manifest it without having it in Himself. Thus three acts, states or relationships—here the terms coincide—indissolubly bound together, are different but equal expressions of the entire Godhead. (Solovyev [1889] 1948, 48)

Solovyev continues by identifying and naming these three co-eternal equal expressions (hypostases) of the entire Godhead—Father, Son, and Holy Spirit. The unity of the Father, the unity in being is actively manifested in the Son, the direct action (the word) of the Father both united in this difference by the Holy Spirit (Solovyev [1889] 1948, 157).

Solovyev follows here Hegel's reflections on the Triune God. God is omnipotent, that is, not limited, because God is the absolute difference within himself. This is Hegel's "otherness" of God within God. For Solovyev, outside of God is chaos, that is, total absence of form. There we have reached the point of origin of creation, namely, chaos as the pure possibility of being. Without being anything in particular, chaos "is" nothing at all. God the Almighty, however, wants to give room to chaos, wants chaos, the antithesis of God, to become reality. God wants to give existence to what is outside of God, to embrace what is not God. Chaos has a chance to become something because God's love is so powerful that he gives existence away. With this gift of existence, creation can become itself. Thanks to this gift of existence, the gift of creation is genuinely given, really turned over to creation. In this way, creation is free to become itself.

Here is perhaps the critical difference between Hegel and Solovyev. For Hegel, the path of nature is predetermined. It is the spirit that, step by step, ascends toward becoming itself.

Within nature, there is this Lamarckian drive toward increased perfection.

Solovyev avoided this pitfall. He studied and deeply admired Charles Darwin's work,[15] which made such a powerful case that nature could create itself. "Why are the labors and efforts necessary in the life of the world" Solovyev writes:

> Why must nature experience the pains of birth, and why, before it can generate the perfect and eternal organism, must it produce so many ugly, monstrous broods which are unable to endure the struggle for existence and perish without a trace? Why does God leave nature to reach her goals so slowly and by such ill means? Why in general, is the realization of divine idea in the world a gradual and complex process, and not a single, simple act? The full answer to this question is contained in one word, which expresses something without which neither God nor nature can be conceived; the word is *freedom.* (Solovyev [1873] 1948, 179)[16]

This brings us back to the passage from Stephen J. Gould's work cited earlier. Divine freedom and human freedom are indeed the prerequisites for the Christian understanding of the relationship between the creator and his creation. Love is freely offered and has to be freely returned: there is no other loving way.

By taking Darwin's discovery that evolution works by natural selection of favorable variations seriously, Solovyev moved away from the progressive, Hegel-Lamarckian view of nature. This opened the possibility to see nature as becoming itself, not forced by any drive imposed on it. By forcing neither world nor God, Solovyev remained closely in the realm of love. His point is that creation originates in the love of God, who creates creation in such a way that it can create itself! That this is really so is the basic lesson the scientists of all ages learned from studying the book of nature. It beautifully confirms the basic point of Holy Scripture, namely that God is love.

Out of love, God gives to creation the gift to create itself. Genuinely given gifts, somehow, reflect the nature of the giver. From the evolution of matter to the evolution of life, including human beings, their art and culture, it is synthesis that creates.[17] The ontological structure of all that is, is identity in the difference, unity in diversity.

That all creation is structured in this way might be a reflection of the Trinitarian nature of the Creator.

NOTES

1. Recently, an exciting result was reported that corroborates the Big Bang model. The original explosion generated tremendous heat that can still be measured today. Mapping of the temperature differences that still exist in space illustrates that the universe

is still hotter in the central, equatorial regions as compared with polar areas. The map also shows unequal distribution of heat, most likely due to the turbulence in matter that "froze" from energy. For a picture of this map, see *Nature* 356, 741 (1992).

2. For an entry into more recent literature on nucleosynthesis, see *Nature* 357, 379–84 (1992).

3. This is not advocating teleology because there is no program that could guide cosmic evolution. There are goal-oriented processes in nature, such as embryonic development or purposeful behavior of organisms. Both, however, are dependent on genetic programs. Ernst Mayr classifies such program-guided processes as *teleonomic* processes (Mayr 1982, 48.) For processes that are not guided by a program, yet have a predictable outcome because of physical law, Mayr uses the term *teleomatic* processes. He gives the example of a falling rock on a mountain slope that bounces toward the valley. Mayr writes: "The entire process of cosmic evolution, from the first big bang to the present time, is strictly due to a sequence of teleomatic processes on which stochastic processes are superimposed" (Mayr 1982, 49). I disagree with Mayr on this point because the falling rock example is an example for the behavior of closed systems. In such systems, order decreases while entropy increases. They move toward equilibrium, the lowest possible energetic state. Cosmic evolution, however, happens in a system that drives ultimately on the energy released in the original explosion of the Big Bang. Evolution is the result of a energy input, not energy output, as in the example of the falling rock. I agree with Mayr that cosmogenesis is a probabilistic, historic process. This process, however, is not teleomatic but morphogenetic. For morphogenetic, yet probabilistic processes I suggest the term *teleomorphic* processes (Brun 1994).

4. For current information, see *Science* 256, 1396 (1992).

5. Ernst Mayr (1982, 63) gives a short history of emergentism in biology. He also points out that two false claims against this view have to be rejected: it is not a vitalistic concept and does not deny the necessity to study nature by trying to understand its parts. Emergentism points out that complex systems must be studied at all levels of their organization. This is so because complex unities are integrated entities, they are, therefore, hierarchically organized.

It is important to point out, however, that this view is stressing the importance of the gestalt concept, namely that the whole has qualities that are not present in its parts. The concept is probably rooted in organismic wholes already studied by Aristotle and later expanded to all unity, for example in the monadology of Leibniz. Borrowing from Leibniz and Spinoza, the concept of wholeness (or Gestalt) became the key concept in the works of Goethe as well as Hegel.

6. Variation and selection are the two components of organismic evolution. In my opinion, there is an analogous phenomenon to "selection" in physical evolution: physical entities (atoms, molecules, etc.) can only exist ("survive") in stable states within mathematical landscapes.

7. Michael E. Akam (*Nature* 362 [1993]: 509) points to this reductionist language when he writes: "It is a profound error to equate a mutation that changes the symmetry of torsion (in a snail) with a mutation that invents the mechanism of torsion itself. This is like saying that all the genetic difference between male and female, oogenesis and spermatogenesis, are specified by a single gene on the Y chromosome. This may be true at the population level, but it tells us absolutely nothing about the developmental complexity of the process itself."

8. See Kauffman (1993) and references therein, particularly the chapter entitled "Order and Ontogeny," pp. 407–520.

9. For an elaboration of this view and its implication for the arts, see Brun (1993, 1994).

10. Leibniz writes: "Although many substances have already attained a great perfection, yet on account of the infinite divisibility of the continuous, there always remain in the abyss of things slumbering parts which have yet to be awakened, to grow in size and worth, and in a word, to advance to a more perfect state . . . there is a perpetual and most free progress of the whole universe in fulfillment of the universal beauty and perfection

of the works of God, so that it is always advancing towards a greater development" (cited from Ernst Mayr 1982, 324).

11. Part of the Jewish inheritance that determined Christian understanding of creation came from the Genesis texts in the Old Testament. There, God the creator creates by the power of his word alone. This is in striking contrast to the understanding of other (Greek) cosmologies. There, the creator created the world out of matter which was thought to be co-eternal with God.

For a history of the doctrine of creation out of nothing, see Gerhard May (1978).

12. Perhaps the most painful retreat of faith so far was the replacement of William Paley's Divine Designer by Darwin's discovery of natural selection. God the creator of all of the wondrously adapted living beings was replaced by evolution that simply followed natural law: faith was replaced by science. Each time there was significant scientific progress in our understanding of how the world works, God's action in this world became less necessary. But there were still gaps in our understanding of how the world works. Gaps, such as how humankind originated or how life began on earth, gaps that could only be explained by God's action. Painfully, we have come to understand that such gaps are not the proof of God's intervention but that they only seem to exist because we are still lacking in our understanding of how nature works. "The God of the gaps" was the God introduced "to explain areas of scientific ignorance, and destined to retreat in the light of new knowledge to become the Retired Architect, the inactive God of Deism" (Barbour 1966, 43).

13. For biographical information on Vladimir Solovyev see the introduction to Solovyev's *Lectures on Godmanhood* by Peter Zouboff.

14. For Solovyev, the unification of the Eastern and Western churches into the one Church, the spouse of Christ, was an urgent task to be accomplished. He worked very hard for the unification of the orthodox church of Russia with the church of Rome. He made it clear that he did not understand unification as a merger. The church of the East and the one of the West did not have to disappear into one another but should be harmonized into the true unity of the One Universal Church (Frank 1950, 75).

15. Solovyev admired Darwin, especially for his views as expressed in *The Descent of Man* about the origin of beauty in nature. See Frank (1950) 136.

16. Solovyev clearly saw the importance of safeguarding the freedom of creation in order to safeguard the freedom of humanity to enter into a loving relationship with its creator. He made his point in his lectures at the University of Moscow in 1876 by using the detailed information he had obtained from Darwin's major works: *Origin of Species,* published in 1859, and *The Descent of Man,* which became available in 1871.

17. The Neoplatonic emphasis on the One, the insight that unification creates novelty, has been integrated into Christian thought by the Fathers of the Church. For example, Saint Augustine writes ([ca. 391] 1991, 169): "To be truly formed is to be brought into a unity. For what is supremely one is the principle of all form."

The insight that synthesis creates is central for the work of Father Teilhard de Chardin. On 4 November 1917, he wrote: "For union is the creative process," and "to create is to unite" (cited from de Lubac 1971, 15).

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