INSTITUTE FOR THEOLOGICAL ENCOUNTER WITH SCIENCE AND TECHNOLOGY

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It's Lent and many things run through the mind when the belly is emptier than usual. Recent experiences rush into the foreground more than usually. One of these experiences was a very careful, meditative reading of Dr. Rudi Brun's article reproduced in this issue of the *Bulletin*. How are we to consider the theology, the meaning, of the human body, of the universe?

St. Paul in First Corinthians remarks that it was not with a show of oratory that he exhorted the Corinthians to further union with and in Christ. "For Christ did not send me to baptize, but to preach the Good News, and not to preach that in terms of philosophy in which the crucifixion of Christ cannot be expressed.... As scripture says: I shall destroy the wisdom of the wise and bring to nothing all the learning of the learned.... And so, while the Jews demand miracles and the Greeks look for wisdom, here we are preaching a crucified Christ; to the Jews an obstacle that they cannot get over, to the pagans madness , but to those who have been called, whether they are Jews or Greeks, a Christ who is the power and wisdom of God."

Whenever we seriously theologize we cannot ignore this message. We preach a Christ crucified — and risen. All parts of any Christian theology must bear this in mind — we do not preach one thing and talk about another. Although it may be difficult to talk about the human body or the universe in terms of the suffering (and resurrection) of Christ, there is really no other category to use. In brief, we cannot rely on the this-worldly to think prayerfully about the body (as much as that might contribute to our thought). We believe in Christ crucified. Let us keep this in mind when we speak of the excellence of the body and the goodness of creation. Anything else would be false. It would fall far too short of the Christian mark.

In that spirit, let me wish you a Blessed and Joyous Easter. We have risen with Him, but not yet totally. That, too, will come in time — we hope.

Robert Brungs, S.J.

The ITEST Bulletin: Publisher, Robert Brungs, S.J.; Editor, S. Marianne Postiglione, RSM

ITEST Offices: Director, Robert Brungs, S.J.
Director of Communications, S. Marianne Postiglione, RSM
221 North Grand Boulevard
St. Louis, Missouri 63103 USA

ISSN 1073-5976 (314)-977-2703; FAX (314)-977-7264 e-mail: postigm@slu.edu Website: http://ITEST.slu.edu

ANNOUNCEMENTS

1. Mark your calendars for the October 20-22, 2000 workshop. We will examine the theological (mainly systematic and doctrinal) issues emerging from biological advance. ESSAYISTS: Msgr. Paul Langsfeld, Professor of Theology at Mount St. Mary's Seminary, Emmitsburg, MD; Fr. Donald J. Keefe, SJ, Professor of Systematic Theology at St. Joseph's Seminary, Dunwoodie, Yonkers, New York; Dr. Michael Hoy, Dean, Lutheran School of Theology in St. Louis and Dr. Carolyn Schneider, Professor at Texas Lutheran University.

This workshop will follow the usual ITEST weekend format: Friday Evening to Sunday Noon at a new location, for us: Mercy Center, 2039 North Geyer Road, St. Louis, Missouri 63131. Situated in West St. Louis County, the 70-acre campus is located within 30 minutes of downtown St. Louis and Lambert International Airport. Owned and operated by the Sisters of Mercy, Mercy Center Conference/Retreat ministry provides comfortable space for conference and retreat activities. The grounds are beautifully landscaped and suitable for various activities: reflection, prayer, walking, and so on. We pray for good weather for this October weekend. Invitations will go out to all on the ITEST mailing list in April or May.

There is one drawback with Mercy Center this October. We were able to contract for only 20 rooms. We'll need seven or eight for single occupancy. We can still accommodate about 23 or so people at Mercy Center in double rooms. Please don't let this keep you from attending. Many of the local membership will be able to commute easily to the Center.

2. The Saint Petersburg School of Religion and Philosophy (SRPh) is organizing a conference on *Science and Faith: The Problem of the Human Being in Science and Theology*. This will be the first comprehensive consideration of this issue ever undertaken in Russia. They expect not only Russian scholars and scientists to participate, but also many from abroad. Representatives of scientific foundations, political leaders from Saint Petersburg, journalists, and other guests will also be in attendance. The conference will be held from November 30-December 2, 2000 and is part of the week-long celebration of the Tenth Anniversary Jubilee of the School. For more information about the conference contact the organizer of the conference, ITEST member, Dr. Natalia Pecherskaya, Director, St. Petersburg School of Religion and Philosophy, Universitetskaya emb., 5 199034 St. Petersburg, Russia. e-mail srph_pech@infopro.spb.su

3. The ITEST Staff is preparing a new membership directory for those who have paid dues for 1999 and 2000. If you have changed your address, phone, e-mail or other vital information since you renewed for calendar year 2000, please let us know by June 1 for an update in the pages of the *Bulletin*. We hope this directory will be helpful to you. Be assured that we don't give (or sell) our mailing list to anyone.

4. Be sure to access the ITEST Web Site for all the major articles published in the ITEST Bulletin from 1999 through 1996. We project that by the Summer of 2000, all articles from volume 26, 1995 will also be on the Web. We contracted with someone to enter this material on the Web Site. Plans for continuing the project depend on available funds. *If anyone would like to contribute specifically for this project, we would be assured of its continuance.* Our long range goal is to have all major articles from the ITEST bulletins on the Web Site within the next five years. We have heard from people who have used the articles and find this service quite helpful. We have reconfigured the web site slightly to make it a little easier for people to find material they are researching. Let us know if you have any suggestions.

IN MEMORIAM

Fr. Florentine Idoate, S.J.
Mr. Virgil Meyer
Fr. Julian Rubio, S.J.
Dr. Richard Zinsmeister

We also ask your prayers for ITEST members who are ill. May they feel the restoring hand of the Lord.

GENES, EVOLUTION, AND THE WORD OF GOD IN CREATION

Dr. Rudolf Brun

Dr. Rudolf Brun is a developmental biologist in the Biology Department of Texas Christian University in Fort Worth, Texas. He received his Ph.D. in biology and a minor in philosophy from the University of Basel, Switzerland. He has numerous publications in scientific journals. He teaches Developmental Genetics, History of Biology, and Religion and Science. He was a close friend of the theologian Hans Urs von Balthasar and received his (informal) training in theology from him and his associates. He has also published in ZYGON, Journal of Religion and Science, and in COMMUNIO, an international Catholic review. His most recent book is titled: Christianity, Science and Art: Towards an updated Christian doctrine of creation.

This essay has three parts. *The first section* deals with mechanisms that increase genetic complexity in evolution. The argument is that genomic complexification is the fundamental force that brings forth new organisms. *The second part* ponders the question whether evolution is goal-oriented. It addresses the nature of the relationship between the history of creation and Divine providence. *The third part* attempts to update the Christian theology of nature. It includes a critique of process theology. This part offers a reflection on the Word of God in creation.

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 thai 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 compete 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 is still present and functional in sea urchins and in vertebrates. The conclusion is that the genes that controlled flatworm development became at least a 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 a 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 form 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. Tellhard 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, biologist 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 then 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 eggs 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 theologian 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 thaf 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. Biologist 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 examples 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 form 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 generated 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 the 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 to 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. Leib-

niz 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 of less) guiding the creative process of nature. (For variations on this Whitehead/Hartshorn/Peacock theme and references see: Russell, 1993[8]).

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 occur 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 prob-

lems 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 GodMan, 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..." (Rm. 8: 28). The mission does not exclude the experi-

ence 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 save 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 believe 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

1. Rudolf A. Raff: *The Shape of Life, Genes, Development, and the Evolution of Animal Form*. University of Chicago Press, 1996, p. 32.
2. Ian Stewart: "Emerging New Science." *Nature* 374, 1995, p. 834; review of Klaus Mainzer's book titled: *Thinking in Complexity: The Complex Dynamics of Matter, Mind, and Mankind.* Springer, 1994.
3. John T. Bonner: *The Evolution of Complexity by Means of Natural Selection*. Princeton, University Press 1988. Smith, M. and Szathmary, E.: *The Main Transitions in Evolution.* Freeman, Oxford, New York 1995.
4. Don Johansen: "In Search of Human Origins. Episode 1, The Story of Lucy." Video tapes, *NOVA*, produced for PBS.
5. Rudolf B. Brun: *Christianity, Science, and Art, towards an updated Christian doctrine of creation.* p. 62ff. http://geowww.-geo.tcu.edu/brunbook/index.html
6. See Stuart Kauffman's gorgeous book with the same title: *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. Oxford University Press, 1995.
7. René Descartes: *The World and Treatise of Man* in: "The Philosophical Writings of DESCARTES," translated by John Cottingham, Robert Stoothoff, and Dugald Murdoch, Vol. 1. Cambridge University Press, Cambridge, 1985. p. 92/93.
8. Robert J. Russell, "Introduction." In: *Quantum Cosmology and the Laws of Nature.* R. J. Russel, N. Murphy and C. J. Isham, editors. Vatican City State: Vatican Observatory, and Notre Dame Indiana: Notre Dame Press, 1993.
9. Niels H. Gregersen: "The Idea of Creation and the Theory of Autopoietic Processes." *ZYGON*, vol. 33 no 3 (September 1998) pp. 333-367.
10. Hans Urs von Balthasar: *Love Alone; The Way of Revelation.* Compass books, Burns and Oates, London 1968, p. 48.
11. *Ibid.* p. 58.
12. Robert Brungs, SJ: "Director's Message." *ITEST Bulletin* vol. 30, no. 4, 1999, p.l.

EUGENICS AND ASSISTED REPRODUCTION TECHNOLOGY

Dr. Jean Kitahara Frisch, SJ
Sophia University — Tokyo, Japan

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ABSTRACT

The increasingly common practice of prenatal and preimplantation genetic diagnosis risks fostering in society a eugenic type of mentality. While a distinction must be made between compulsory, state organized, eugenics and freely made reproductive choices, one cannot ignore the impact of private choices on society as a whole. Examining the historical, scientific and social roots of eugenics in the recent past may help bioethicians to devise steps preventing assisted reproduction technologies from sliding into uncontrolled eugenic practices.

Eugenics has long had a bad reputation, due chiefly to the horrifying and humanly degrading experiments performed in its name by the Nazi regime. However, it has recently often been pointed out that eugenics as a policy enforced by the State ought to be sharply distinguished from private decisions freely taken by individual couples aiming at optimizing the quality of life of their children. Some may even claim that this second kind of eugenical practice should be regarded as one aspect of the "reproductive rights" that were vigorously defended at the 1994 United Nations sponsored Cairo Conference on Population Problems.

It is therefore opportune, necessary even, to reexamine first more closely the origins and social background of eugenics and to make certain, from the bioethics viewpoint, how basic the difference is between eugenics as a State policy and freely individually practiced eugenics. Nazism provided an abhorrent example of the first kind of eugenics. But why, it may be asked, could not one recognize as legitimate, and even beneficial, the possibility for parents to bring forth healthier children, provided with some of the qualities they themselves highly value?

It is here argued that this second kind of eugenics, called by some *utopian eugenics* (Kitcher, 1996) or *privatized eugenics* (Appleyard, 1998) is in fact already widely practiced, by making use of assisted reproduction technology as helped by preimplantation genetic analysis of embryos and the steadily more accurate knowledge of the genetic basis of human diseases as well as of other characteristics of the expected offspring.

It is further argued that such practices, by the eugenic mentality they foster, constitute a grave threat to future human society and that steps should therefore be taken to make sure that recent reproductive technologies do not promote a type of eugenics that would offend the dignity of human life.

The origins of eugenics

As has often been observed, Darwin's natural selection hypothesis, though based on abundant scientific data, was formulated in a specific historical context, namely the economic liberalism and free competition that characterized the rapid industrial and commercial expansion in nineteenth century England. Following Adam Smith, economic prosperity and social progress were considered to be the fruit of free trade and competition. These were seen to allow economic selection eliminate the ill-adapted enterprises and let only the fittest survive. Although Darwin is said to have been unaware of the social implications of his theory, many were those who saw how that theory suggested a similar selection to have occurred in the history of life and to be at work in nineteenth century English society and economy. In both cases progress could easily be seen to result from the selection of the better adapted and the elimination of those who failed to adapt.

It is also important to notice how, beyond Darwin, these ideas further developed in what was eventually called "Social Darwinism." According to that doctrine, since free competition and selection were considered to be the motor of progress in society as well as in biological evolution, no attempt should be made by society at helping the physically or economically poorly adapted. Helping the economically weak or physically handicapped by public laws would, it was argued, constitute an obstacle to social progress. Such human laws would indeed run against the basic law of Nature.

Similar ideas are also found at the origin of what Francis Galton, Charles Darwin's cousin, called "Eugenics". According to Galton, social and scientific measures should be taken so as to promote the uninhibited working of natural selection by eliminating less well adapted and weaker individuals and favoring the reproduction of the

more vigorous and better adapted. "With characteristic Victorian confidence," Kitcher writes, "Galton did not offer a critical discussion of the values underlying his judgments about proper and defective births. Assuming that his readers would agree about the characteristics that should be promoted, he set about the business of promoting them (Kitcher 1996: 191)."

In Germany, Ernst Haeckel, the well known embryologist and champion of evolutionism believed it was the function of morality to favor natural selection. He therefore considered it to be the mission of the state to practice a eugenic policy through the artificial selection of the more vigorous individuals. Haeckel was particularly fond of praising the ancient Greek city of Sparta where only the perfectly healthy and well formed newborns were allowed to survive, the weak or physically handicapped being sacrificed shortly after birth. Thus, always according to Haeckel, the Spartan population enjoyed a continuous health and vigour not seen in other cities, an example that should be followed by Germany. He also suggested that an appropriate commission made up of physicians should identify sickly and handicapped individuals so as to eliminate them through a painless injection or drug. This, he added, would be all benefit to these individuals themselves and to society as a whole.

Needless to say, Haeckel's program was put into practice a few years later in Nazi Germany, with the horrifying results that gave rise, after the war, to the Nuremberg code of medical ethics and to the birth of Bioethics as a new discipline. It is important, however, to recall that similar policies had been proposed, well before Hitler, by biologists and physicians in a number of other countries, such as England and the United States.

As noticed by Arthur L. Caplan, "In the U.S. for much of the first half of this century, the mentally ill, and the retarded, alcoholics, recent immigrants ... became the object of government-sponsored sterilization efforts aimed at preventing the spread of "bad" genes to future generations." (Caplan, 1994, see also Lumerer, 1972). On her part, Margaret Sanger, the well-known American propagandist of birth control "constantly spoke of children who should never have been born, those children who pollute the race and drain the world of its resources." (Murphy, 1994: 8).

Similar ideas, privileging the strong at the expense of the weak, can also be found in other countries, such as can be seen in books published in prewar Japan.

Enforced and utopian eugenics

Examining the historical, scientific and social context of eugenics in the recent past may help us to better understand how to evaluate the possible longtime social consequences of modern techniques for prenatal genetic diagnosis aimed at selecting the birth of healthy babies. Although it may be claimed that the selective abortion of handicapped or diseases fetuses proceeds from the free choice of individual couples and cannot be compared to the policies enforced by the State, as in Nazi Germany, it should not be difficult to see how prenatal genetic diagnosis, when accompanied with the abortion of fetuses carrying grave hereditary handicaps or diseases, is inspired by ideas similar to those that guided the policies advocated by Ernst Haeckel. This is well perceived by groups of handicapped people and their families who see selective abortions as denying their right to live. Theirs is seen as a so-called *wrongful life* whose birth could have been prevented by a better medical technology. Accordingly, given recent progress in genetic diagnosis, "people that do bring handicapped children into the world will be looked upon as foolish and irresponsible" (Appleyard, 1998: 135). Indeed it is not hard to see how individual choices will progressively alter society's view of handicaps.

Emphasizing the distinction between compulsory and freely chosen eugenics may be thought to ignore the fact that individual choices are never made in a social vacuum. Certainly, the immediate motivation in the two kinds of eugenical practice may differ there legally enforced, here freely chosen. But the long term social effects of both practices remain the same. Thus, enforced and utopian eugenics may be closer by their nature and their effects than currently imagined by many. To deny this would be to close one's eyes to the impact of private choices on society as a whole.

"For me," writes Appleyard, "it is all too obvious that those who deny the title eugenics to anything other than coercive, socially targeted control of reproduction, are doing so because they wish to avoid the Nazi taint," and further, "the debate should not, however, be blurred by concealed fears of the word itself. It is not the name given to something that is most important, rather it is the scale of values we apply that matters."(Appleyard, 1998, 80-81).

Assisted Reproduction and Eugenics

More recently, *In Vitro* Fertilization (IVF), a technique developed as a remedy to infertility, proceeds one step further in the same direction as prenatal diagnosis. This is because IVF, as now widely practiced, nearly always involves the production of so-called "supernumerary embryos." It therefore has led naturally to the analysis of the genetic qualities of the early embryos before implantation in the mother's womb, the embryos judged to present a genetic "risk" being discarded and only those pos-

sessing characteristics highly valued by the parents being selected for implantation.

It therefore becomes evident that some of the procedures closely associated with IVF tend to foster in society a eugenic type of mentality that most people in our society once used to find deeply repugnant. This is a mentality that values people not for their humanity but for the qualities they possess. Moreover, as the practice spreads, there is little doubt that IVF will soon be used not only as a remedy to infertility but also as a means to choose the qualities of one's child. In such a society, people with handicaps will then increasingly be regarded as the result of technology's "mistakes" or the parents' irresponsibility.

Utopian eugenics as a threat to future human society

When discussing the ethical implications of IVF as a technique of Assisted Reproduction, attention has often been drawn to the number of sacrificed human lives that accompany each successful birth. Indeed, the discarding of so-called supernumerary embryos appears to take for granted the legitimacy of using abortion for promoting the quality of human lives. For those who believe that human life begins at conception this would seem to be a powerful reason for questioning the morality of IVF and embryo transfer (ET).

However, even for the many who do not share this view of the moment when a human child begins to exist, the *selection process* whereby some embryos are discarded and others allowed to further develop by being returned to the mother's womb is bound to raise disturbing questions. Confronted by the possibility of selecting lives, have not many citizens of the affluent democracies already begun to alter their attitudes toward the value of human lives? If the desire to avoid the birth of severely handicapped children suffices to eliminate the discarding of some human embryos, are not we already being psychologically conditioned to eliminate embryos that, for a number of reasons, will probably not enjoy the quality of life their parents expect for their children? Where then shall we draw the line an embryo has to reach in order to be allowed to further develop and be born?

In short, does not the increasingly widely practiced IVF and preimplantation diagnosis lead the individual members of our society to adopt standards and practices quite similar to these advocated as public policies by Haeckel and Galton? This is well perceived by groups of handicapped people and their families as denying their right to live. Theirs will be seen by many as a so-called "wrongful life," that is a life whose birth should have been prevented by a better medical technology. Accordingly, people who bring into the world handicapped children that could have been aborted will probably be looked upon as foolish and irresponsible.

As a matter of fact, similar questions were raised recently in some notes written by Semba Yukari, a graduate student at Waseda University. Therein she points out the need for bioethics to evaluate the possible consequences of assisted reproductive technologies (IVF and ET). Here are her main comments:

1. A technology, once developed, if it happens to answer the needs of some people, tends to expand and influence the ethical judgment of public opinion regarding the ... "morality" of that particular technology. This well appears in the case of IVF and ET. These were first highly suspect to many but, as their practice spread, (they) became progressively accepted, without however any answer having been given to the ethical questions first raised.

2. In a more general way, it may easily happen that the interests of some individuals cause a technique to spread in such a way that it develops in unexpected directions which do not correspond to the true wishes of society as a whole.

3. It is therefore imperative for a new technology not only to be freely chosen by the patient, but to have its possible social consequences carefully examined.

What was written above about the ethical questions raised by assisted reproduction technologies makes it clear that the points made by Semba Yukari deserve serious consideration on the part of bioethicians. The frequent practice of IVF and ET, accompanied by preimplantation genetic diagnosis, is bound to foster in society a mentality that values human beings not for their humanity but for the qualities they possess. Moreover, as the practice spreads, there is little doubt that IVF will soon be used not only as a remedy to infertility, but also as a means for choosing the characteristics of one's child. In such a society people with handicaps will increasingly be regarded as the result of technology's "mistakes."

If it remains uncontrolled, the practice of IVF and fertilized egg genetic diagnosis will create a capacity for a kind of "homemade eugenics" where individual families decide what kind of children they want to have. At present, the kind they select are those without disabilities or diseases. In the future some couples might have the opportunity, via the genetic analysis of embryos, to have *improved babies*, children who are judged likely to be more intelligent, or more athletic, or better looking, whatever this may mean! In this sense, the development of Assisted Reproduction Technologies provides a clear example of the points Semba proposes to the reflection

of bioethicians. How could this slide into eugenics be avoided, or at least its danger reduced?

Possible counter-measures

Prenatal diagnosis is probably here to stay and the increasingly more widely used methods of assisted reproduction will almost inevitably also lead to the practice of preimplantation genetic diagnosis. The question here asked is thus: how can both kinds of diagnosis be controlled so as to avoid their fostering a eugenic type of mentality in society as a whole?

1. A radical measure would be to restrict the use of IVF to cases of medically ascertained cases of infertility. Such a restriction, however, is not likely to be readily accepted. (cf, French legislation Documents, p. 219, 227, 230)

2. Public financial support for prenatal or preimplantation genetic screening could be restricted to couples considered to be at risk of giving birth to severely handicapped children (because of previous such births). One could thereby avoid genetic screening to become routinely practiced in all pregnancies, independently of the wishes of the mother.

3. All kinds of genetic diagnosis should be obligatorily accompanied by competent genetic counselling.

4. The target of preimplantation or prenatal diagnosis should be limited to incurable, serious hereditary diseases or disabilities, preventing thereby a slide from negative eugenic practices to positive, quality enhancing eugenics. In this way one may hope to avoid the eugenic selection of embryos on account of their sex or because of preferred qualities (intelligence, good looks, etc.).

However, it will be evident to many that the slide from negative to positive eugenic practices will not be easily prevented by mere legal regulations. The debate should rather be about where good eugenics shades into bad, and we can make that judgment only on the basis of our total view of life.

Conclusion

From what was written above it will be clear that the basic question raised by the new methods of assisted reproduction and genetic diagnosis is that which much of modern technology confronts us with today. Shall we make use of technology for technology's sake? Or shall we use it only when it helps us, and society, to become more human? In other words, shall we become the servants of technology? or shall technology remain at the service of our human ideals? Beyond individual choices, the new possibilities opened to us by advances in the Life Sciences, once more force us to reexamine what are our basic values, what sort of society we wish to live in and leave to our children (Alonso, 199).

Obviously, a social mentality privileging the stronger and more richly endowed is inimical to the basic values proposed by Christianity. Not only does a Christian view of man regard all men as equal but it also sees in each of them a beloved "child of God." Christ himself, indeed, gave us the example of a preference for the sick, the weak and socially disadvantaged, those that are called "blessed" in the Sermon on the Mount. As is well known, this is why, in the eyes of Nietzsche, Christian ethics were despised as an "Ethics for slaves."

The recent tragedy of Nazism reminds us how, even in a highly cultured Christian country, the way society looks at people — the commonly accepted value judgments — can influence the future of society and contribute to render it either less or more human. The practice of genetic screening, far from being merely a matter for personal choice, must be seen in all its far reaching social and human consequences. As John-Paul II once said when visiting Hiroshima: "To remember the past is to become responsible for the future." The universally condemned crimes that resulted from the eugenic mentality of the Nazis should constitute a powerful reminder of the possible, not to say the likely, consequences of genetic screening and assisted reproduction technology as now practiced.

REFERENCES

Appleyard, Bryan., *Brave New Worlds. Staying Human in the Genetic Future.* Viking 1998.
Caplan, Arthur L., "Handle with care: Race, Class and Genetics." In: Timothy Murphy and Marc Lappe (eds) *Justice and the Human Genome Project.* Univ. of California Press, 1994.
Kicher, Philip., *The Lives to Come.* Simon Nd Schuster, 1996.
Ludmerer, Kenneth M., *Genetics and American Society: A Historical Approach.* Johns Hopkins Univ. Press. 1972.
Murphy, T. F. & Marc Lappe, (eds) *Justice and the Human Genome Project.* University. of California Press, 1994.

A TIME-DEPENDENT GOD?

Dr. Thomas Sheahen

Human beings experience time sequentially. Things happen *before* or *after* other happenings. We have no other

experience, no other way to speak about our lives, no other way to *think*. Probably the most fundamental notion of all is that you can't change time around in any way. Even in the science-fiction category of *time travel*, it is impossible to avoid the sequential occurrence of event, expressed by words like *before* and *after*.

On the other hand, we are generally in agreement with the statement that God is *omnipresent*, that is, cognizant of all times at once. But no one really attends to what that means. We imagine God in a way that has Him acting sequentially in time, just as we ourselves must do. Because we have no experience other than this, our understanding of God is necessarily distorted with regard to the way God handles *time*.

It is the purpose of this essay to explore this topic.

Evolution has become a very contentious issue between theists and atheists. Those who assert that God is irrelevant to the universe look at the march of evolution over billions of years and derisively ask, "Well, if God is so powerful, why did he have to *wait so long* for everything to evolve?" Most religious thinkers have no answer to this question, because they implicitly accept the underlying premise, namely that God experiences the passage of time, and therefore is in the business of *waiting*, just like us. A great deal of the literature of *Process Theology* has God Himself evolving over time. Statements of the form that God is self-limiting, vulnerable and participating in human history are all rooted in this assumption about God.

To see where this unfortunate belief leads, it is useful to enter into it on a cosmic scale, in a fanciful way:

Imagine, if you will, the experiences of this time-dependent god. We'll call Him Jehovah, the Lord of all *our* universe. But perhaps there are other universes, utterly unknown and unknowable to us, and they would each have their own god. Perhaps every billion years or so, they all meet at a convention of gods. What would they talk about?

One such convention took place only 7,000 years ago. During a coffee break, Jehovah ran into his old buddy and fellow god, Chartillion. The conversation went like this:

Charlie! I haven't seen you in ages! How are you?

Just fine, Jerry! Everything's going well over in my universe. How you doin'?

Not bad, Charlie; not bad at all ... Just a little slow these days.

Why, Jerry, what's going on?

Well, I don't know *why* I ever let you talk me into trying that *evolution* stuff! Man, what a drag.

Gee, what's wrong? Didn't it work out for you?

Not really, not very well... Look, I did everything you told me — super-dense energy, intense radiation, condensing into particles, all that. The whole thing got off to quite a spectacular start, and I was really impressed, really looking forward to some fast action. But then it slowed down a *lot*....

Well, Jerry, I told you you'd have to wait through one full generation of stars before things got interesting.

Sure, and I was prepared for that, so I didn't mind those first 8 billion years. I did other stuff for a while. But then when *real* evolution got under way, I was expecting something big.

And ...?

Well, I looked all over the place, galaxy after galaxy, countless big gooey gas-giant planets, the whole nine light-years. Finally I found this one cute little planet, fairly close to a pretty average star, with a nice mixture of various elements combining into chemicals, and I really got my hopes up. I thought up something I call *thermodynamics*, and figured we were really starting to move! There was even *weather* on this planet, with water and gases going back and forth in cycles. I was on a roll.

Then what, Jerry?

Well, evolution started to produce *life*, and I was really excited. But then (yawning) ... Holy cow, Charlie, have you got *any* idea how *boring* it is to watch *slime* grow on a rock for a billion years?

Well, you just have to be patient for a while ...

For a while?!? Charlie, you didn't tell me what the *final* stage of evolution is! Sheesh, what a waste of time!

What final stage?

Teeth, Charlie, teeth! That's all you ever get! I sat through the amoebas, the trilobites, the plants, and so forth. Finally some little critters crawled up on dry land and I got my hope up again. I can show you the record books — I've got 4 billion years worth of fossils to prove it. Then the critters started growing bigger and bigger . .. but all I wound up with was *teeth*.

What do you mean, Jerry?

I'm talkin' *dinosaurs*, Charlie! Those great big dinosaurs are nothing but teeth! Once they're in place, you can't get rid of them. Half of them eat all the plants, and the other half eat all the smaller critters. They've completely cut off evolution. They're a dead-end.

But, Jerry, maybe you're being too hasty...

Hasty?! I'm going on a cumulative 14 billion years and you call that hasty? Look, Charlie, I had some really neat things starting to climb the "ladder of evolution" as you called it. These little furry guys — arachnids, with eight legs — were really cute and playful. They were about one meter long, with mass of about 40 kilograms, and they were showing signs of real talent — stretching "webs" from tree to tree, clever things I hadn't seen before. I thought maybe they would develop some intelligence or something.

So, how did that work out?

It didn't! The %#$@&*! dinosaurs ate them all! When the Big Teeth got done chowing down, the only arachnids left were the ones too small to find. Every critter that evolved over a few centimeters long got scarfed up by the dinosaurs. I sat there and watched it all happen for another quarter of a billion years, and I couldn't figure a way to get rid of them.

Gee, I'm sorry, Jerry ... where do things stand now?

I have no idea! I got totally disgusted with the whole project, and went to look for other stars and more planets to start over again. As I left that solar system, the last thing I did was pick up a pebble from their asteroid belt and wing it at that planet. I haven't looked back since.

Look, Jerry, I think you should give evolution another chance. Why don't you go back and check the place out again?

Not me, Charlie. I'm moving on. Next time I find a planet with weather, maybe I'll just enjoy tossing thunderbolts around. Forget it!

Well, then, why not send a representative back to have a look? How about your son? Is he busy these days?

I dunno, Charlie. That is an idea, though. I'll give it some thought.

Okay. Well, it sure was nice seeing you again, Jerry.

You too, Charlie. I'll catch you again, next convention. Take it easy.

Hopefully, this imaginative scenario illustrates what a day would be like in the life of a god who is subject to time. Seen this way, such a god isn't all that powerful.

Unfortunately, nearly everyone thinks, talks and acts as though God were limited in this way. That's just a projection of a human limitation onto God. The atheists who are leading spokesmen for "neo-Darwinism" say "Look at evolution, and then don't believe in god"; but they are basically telling us not to believe in a god *who is subject to the rules of evolution, the slow passage of time*. Okay, I can buy that. However, it is terribly important to *distinguish* between the kind of god that fits within our limited frame of thought, and the God that *really* exists.

The *Process Theology* school of thought asks us to believe in a god who is subject to time, just as humans are; and then to adapt our understanding of that god to fit this constraint. Without paying attention to the point, they have denied God's fundamental property of omnipresence. Big mistake.

The well-known quip "Man made god in his own image and likeness" isn't just a smart remark by atheists. It contains a warning about the danger inherent in our very limited human way of thinking and understanding, particularly on so fundamental a point as the *sequential* nature of our lives. We need to go back and look once again at the ways in which we have distorted our understanding of God by artificially limiting Him to our human mode of thinking.

We have not included the listing of new members in this issue. We hope to publish a modest new Directory in the next couple of months, even if only a listing of new members without the usual breaking down into regions and expertise. We are sorry for the curtailment of Directory material but we feel that a new one is necessary. The old one is certainly obsolete these days.