



Easter Season is concluded and Pentecost has come and gone! We are now liturgically in Ordinary Time. But no time is really ordinary. It is the prelude to the Final Kingdom which is still "mysterious."

*Mystery* is that in which we live. *Mystery* is our way of life. All is mystery in the biblical sense of the term. The mystery is Christ Jesus. He is the final and complete explanation of all that was and is and all that will be. The Christ we worship subsumes the history of the universe. It is no small chore (to learn to know Christ) that awaits us in "ordinary time." Our effort should be anything but ordinary.

Is God a part of the universe? In one sense He is. In another sense He is not. In his immanence He is indeed a part of the world. In His transcendence He is not — He is beyond all creation. He is certainly beyond us. In fact, "apart from what natural reason can attain, there are proposed to our belief mysteries hidden in God which can never be known unless they are revealed by God." (*Dei Filius* [1870]). One of these mysteries is Christ come among us. We live in the hope of the revelation of His mercy.

"Even when they (the mysteries) have been communicated in revelation and received by faith, they remain covered by the veil of faith itself and shrouded as it were in darkness as long as we are in this mortal life..." (*Dei Filius*). Mystery is not a puzzle or something "natural" which we don't yet comprehend. It is not a secret known only to the few, the initiated. It is not a conundrum — as in the mystery of the Bermuda Triangle. According to Scripture mystery refers to the plan or design God intends for humanity and for the world. It is God's plan to sum up in Jesus Christ, to unite Jew and Gentile through the Cross so as to form a new humanity and reconcile both of them to God.

Neither science nor theology will completely unveil the mystery which is God with us. Both, however, may give us clues about how we are to behave. There is only one mystery, namely God who communicates himself freely as Word and Spirit, in the incarnation, grace, in history and in vision. This mystery we try to grow into all during Ordinary Time. It is as fruitful a time for us as is Christmas or Easter. In some senses, because it is so "ordinary" it is the most important time. Anyway, Christ be with you these days.

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## ANNOUNCEMENTS

1. Invitations to the October 5-7, 2001 workshop: *Nutrition and Genetics*, have been sent to all ITEST members. If you are planning to attend, we urge you to register early. We must have a final count to the conference center within one week of the target date. We will be charged for rooms whether or not they are occupied. Although you could still attend as a commuter, overnight accommodations will not be available for those who register late. We have been lenient about accepting late registrations, but we cannot continue with this practice. We appreciate your understanding.

Our venue this year will be at The Shrine of Our Lady of the Snows, Belleville, Illinois - a remarkable expanse of acres of natural beauty (it is a major attraction particularly at Christmas time) with all the amenities of a comfortable hotel at a reasonable price.

2. By now you have received the Proceedings of the October, 2000 workshop on *A Theology of the Human Body*. We've received favorable feedback from some members; let us know what you think — favorable or not. We can take it!

3. We received disappointing news from our bulk mail deliverer recently. Because our mail volume is low, according to their standards, the company has decided to drop us as customers (along with many other small non-profit entities). They say it is no longer cost effective for them to process our mail. So, we will continue to e-mail the quarterly Bulletin to everyone on our list who has an e-mail address - except for the few members who requested the US mail. If you've recently signed up for an e-mail address or have changed the one you have, please let us know.

## GENES, EVOLUTION AND THE WORD OF GOD IN CREATION: RE-VISITED

By J. Cyril Hanisko

[*Dr. J. Cyril Hanisko, a very long-time ITEST member, is a physicist/engineer employed by Eaton Corporation. His interests are chaos theory, cosmology and intelligent design.*]

In the Spring 2000 issue of the *ITEST Bulletin*, Dr. Rudolf Brun gave us an insightful and thought-provoking essay entitled, "Genes, Evolution and the Word of God in Creation." God got the universe underway by giving away existence to nothingness. God then let undirected, non-teleological evolution take over, producing material objects as well as history, with God acting in eternity, rather than in time, on persons, rather than on matter or historical processes. There is no anthropic principle in nature requiring the advent of *homo sapiens*. However, self-consciousness necessarily results, because evolution inevitably brings forth increasing levels of complexity. These points, I think, I hope, constitute a reasonably accurate abstract of the article.

I do agree with Dr. Brun's rejection of process theology and the notion that man is saved "through history" (rather than simply "in history"). I think that the examination of his thesis is well worth the doing, especially so because a number of his proposals are refreshing. However, I come not to praise Caesar, because some of Dr. Brun's supporting contentions reignite my suspicions of, and objections to, what strikes me as a too easy acceptance of the notion of all-embracing evolution. So, this article will be critical rather than laudatory.

One of the general consequences of this too-easy acceptance is an imprecision of language which, I think, only serves to promote, unwarrantedly, the establish-

ment of a certain "evolutionary consciousness". We can make the mistake of expressing our subjects in such a way that we lend them a certain psychological credibility which exceeds, perhaps far exceeds, what they merit logically. Under such circumstances, and especially if this manner of expression becomes routine, an invitation to be pre-persuaded is unconsciously extended, which invitation may become well-nigh irresistible.

One example of this pitfall appears, in Dr. Brun's essay, in the first paragraph under the heading "Evolution and Mechanisms Of Genetic Complexification." Dr. Brun writes as follows: "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." I claim that Dr. Brun has the warrant only to write, "This might be the case if genes were so essential ...", not "This is because genes might be ...". I think that the second form of this statement makes a certain subliminal (if unintended) truth-claim, which is not merited by the evidence and which the first form of the statement avoids.

Nit-picking? When taken in isolation, yes. But it is not mere nit-picking when considered against the background of massive cultural pressure for uncritical acceptance of the universality of evolution. Phillip E. Johnson, for example, in his essay in the July/August 1999 issue of *Touchstone*, writes of "... the cultural



power of evolutionary naturalism and ... how thoroughly it dominates the contemporary mind ..." (p. 24).

Another language usage, that has long bothered me, is our willingness to slip into the employment of misleading terminology when discussing evolution: nature "invented"; genes can "talk " to each other (both of these instances are taken from page four of Dr. Brun's essay). Examples abound. I am not against the use of expressive language. And I understand that there is an at least occasional need to use a sort of shorthand. However, shorthand often masks the enormity, or the difficulty, of what we are condensing. And, when the shorthand eventually becomes the avenue of understanding, then we have fallen victim to that psychology of pre-persuadedness, mentioned previously.

For example, I invent. It is a purposeful, goal-oriented activity (at least, that's what I've gotten my bosses to believe). I intend that the result of this activity will integrate smoothly (the buzz-word *du jour* is "seamlessly") into, and extend, the established order. "Nature", on the other hand, stumbles and bumbles mindlessly along, producing mostly throw-aways, according to Darwinism. Very, very occasionally, we are told, nature produces a chance outcome that fits well enough, with what already exists, that this new thing survives. Whatever this process may be, it does not deserve the appellation, "invention", even if the word is put in quotes. The use of the terms "invent" and even "program", as analogies to aspects of mindless evolution, eventually confer an undeserved aura of inevitability and, even, intentionality, unless we are ever vigilant to the fact that they are only aliases.

I have dwelled at some length on these matters because I have long understood evolution to be a meta-theory that depends, for its wide acceptance, less on proof than on its claim to a right-thinking plausibility. Thus, part of the work of raising questions about the soundness of the concept of universal evolution involves the critical examination of the bases of its alleged plausibility. At least some of these bases depend on a failure to hold evolution to a sufficiently stringent standard of language.

Now, I would like to consider, directly, some of Dr. Brun's material. In the section, "The evolution of developmental programs", Dr. Brun introduces the topic of genes forming genetic programs which, in turn, guide development. Dr. Brun states: "Significant evolutionary change might therefore depend upon significant change in development programs" (p.4). Dr. Brun then goes on to describe a scenario for evolutionary change in a genetic program. Genes duplicate and produce a redundant genetic program, which is, at first, quiescent.

Mutations accumulate in the quiescent program, while the development of the entity is controlled by the original, non-mutated program.

Finally, the duplicate program, now mutated, integrates with the original program, resulting in a radically new program, which produces a radically new organism (the survival of which depends on its "fit" with its environment). It is not clear whether this process of duplication, mutation and integration is supposed to take place within a single embryo time span or if it covers generations, with the duplicated-mutated program being inherited along with the original program.

I wonder. If "chance" can combine a radically-mutated duplicate program with an original program, in one step, to produce a new organism, why could not "chance" reach that same result incrementally, providing multiple paths to the same organism and filling in those pesky "gaps" in the fossil record? After all, in the game of "chance", there's nothing that would inherently preclude this.

I wonder further. If a duplicate, but altered program, with alteration great enough to drive radical change, emerged, why should we expect it to remain quiescent until "chance" combines it with the original program, resulting in a smooth integration of the two programs, resulting in the emergence of a radically-altered, but stable, physical structure, which is survivable in the given environment, all by chance? Should we not expect that the two programs, prior to integration, would contend for control, perhaps even asserting control alternately, in some unpredictable time pattern, eventuating in the breakdown of the organism?

And, if the new program were successfully all-at-once integrated with the old program, isn't it reasonable to expect that the embryo carrier, which has developed to accommodate the old program, will not be capable of providing the requirements of the radically-new organism? Surely, a more likely-to-succeed strategy would employ a generations-long, gradual integration of programs. But then we would expect to see incremental changes in the fossil record, the absence of which makes for those troubling gaps.

Writing in the July/August issue of *Touchstone*, research biologist Jonathan Wells notes that " ... mutations in developmental genes are always harmful". Wells goes on to point out that the only DNA mutations known to be beneficial are those that affect immediate interactions between a mutant protein and other molecules, leading to antibiotic and insecticide resistance. However, such mutations " ... never lead to the sorts of changes that could account for evolution". Furthermore, Wells writes,



"[t]he evidence that evolution is due to changes in gene frequencies is likewise surprisingly thin."

On page four of his essay, Dr. Brun writes as follows. "Significant parts of (the flatworm's) genetic program (are) still present and functional in sea urchins and vertebrates." Now this could mean that sea urchins and vertebrates ultimately derived, by chance code mutations, from the flatworm genome. On the other hand, it may simply mean what human writers of software have long known: that is, modularity is efficient.

Commenting on this similarity in development genes, Wells notes that, while initially biologists took it as evidence for genetic programs, they are more recently recognizing its paradoxical character. "If genes control development", writes Wells, "why do similar genes produce such different animals"? Wells asserts that there is good evidence that the cytoskeleton and the membrane, in the egg, play important roles in the control of development. Furthermore, "[t]he fact that development is actually controlled by something more complex than a genetic program — perhaps by the structure of the entire fertilized egg — renders design even more probable."

With regard to the concept of "survival of the fittest" (a.k.a. natural selection), Dr. Brun remarks that "[t]oday biologist(s) accept this Darwinian mechanism of evolution." We do well, at this point, to remind ourselves of two realities. First, by no means do all biologists accept this mechanism. Second, biologists' acceptance of this mechanism does not validate the mechanism as true; the history of science is littered with the remains of concepts that were, at one time or another, universally embraced.

Dr. Brun describes Darwin's mechanism as follows: "According to Darwin 'survival of the fittest' was the natural process that brought forth organisms that perfectly fit their environment." Yet, as has been pointed out (see "Unfit for Survival", in *Touchstone*), Darwinian "natural selection" (i.e., "survival of the fittest") is a circular, question-begging concept: there is no way to predict in advance which mutations will survive. Paul A. Nelson, in his *Touchstone* essay, quotes J.G. Ollason, writing in *Biology and Physics* (6: 81-92), as follows: "The problem with evolutionary fitness is that there is no possibility, in principle, of establishing a mapping, in physical and chemical terms, from the phenotypic properties of the animal to its re-productive output, the main reason for this being that there is no way to define the quality of the phenotype."

And the very fact that we can't predict which random mutations will be selected takes it out of the realm of

science. In fact, if randomness is at the foundation of the universe, one is left to wonder whence comes the basis for "natural selection"? Instead, we are left with the prospect that survival, too, occurs, not by determination, but by "chance."

As do many authors, when writing about evolution, Dr. Brun attempts to show how a process could give the illusion of being goal-oriented, while in fact not being so, by offering some examples from our everyday experience. He selects two such examples: business and baseball. Dr. Brun explains, "[m]oney is the energy that drives the (business) process". Businesses which can extract money from the markets (i.e., the environments) more efficiently than their competitors eventually win.

One of the problems with the business analogy is that, while evolution (if it exists) is a top-down phenomenon (first, the general law, followed by the myriad of its concrete instances, business is a bottom-up phenomenon. That is, generic "business" is not a primitive, non-teleological given from which myriads of concrete instances flow. Instead, the generic concept of "business" is abstracted from the very many enterprises, all of which are manifestly goal-oriented. And the changes which the businesses make, as they attempt to achieve their goals, are designed; they are not the result of chance variation.

Baseball, on the other hand, is top-down. However, it is definitely designed, from the top, and is inherently goal-oriented. In contrast to Darwinian evolution, which is process without purpose, baseball is play with purpose: keeping score is designed into the elemental structure of the game. There is, in this case, an overall goal toward which the players, the coaches, and even the fans strive, and towards which the very structure of the game intends that they strive.

There is also plenty of design involved in any concrete instance of the game: scouting, pre-selection of plays, strategy and tactic correction during the game, and so forth. Although "chance" remains a factor in the playing out of any game, every effort is made to minimize its effect. Additionally, participation in the game, as in business, is freely chosen. It is not the game that makes the players; rather, the players make the specific game, all the while acting within the general structure that defines the game as baseball rather than soccer, for example.

Continuing with our examination of Dr. Brun's material, we note that, on page six of his essay, he writes, "There is no anthropic principle in nature to bring forth *Homo sapiens*!" I think he is not justified in stating that there is no such principle "in nature". Are not "principles"



things that we declare in order to express certain regularities that we discover in nature? He may, then, be justified in stating that men (scientists) have not (yet) proclaimed the existence of such a principle. And this would not be surprising, if (as Dr. Stephen Barr, University of Delaware particle physicist, stated in his presentation to the 1998 convention of the Fellowship of Catholic Scholars) anthropic principles are attempts to account for the existence of the very many anthropic coincidences without reference to God.

Yet, as John Wheeler writes, in his foreword to *The Anthropic Cosmological Principle*: "... a universe in which one or another of the fundamental dimensionless constants of physics is altered by a few percent one way or the other (is a universe in which) ... [m]an could never come into being ... That is the central point of the anthropic principle. According to this principle, a life-giving factor lies at the centre of the whole machinery and design of the world."

Dr. Brun writes further (also on page six of his essay): "Modern science cannot find any evidence that the evolution of the universe is a goal-oriented process." This is hardly surprising (although I would replace the words, "cannot find", with the word, "rejects") in view of the fact that the modern evolutionary paradigm is structured so as to explain away evidence of goal-orientation.

That being said, we consider the following, surprising reflections ("Surprising" because, on several occasions, earlier in their book, the authors make clear that they are no champions of teleology. In this instance, they state only that they "really do not want to defend this possibility".) of Barrow and Tipler [5] (pp. 674-675). "Were one to adopt a teleological view of Nature, one could go so far as to assert that matter has many of its properties today not because these properties are necessary for life today, but because these properties will be *essential* ("essential" emphasized in the book) for the existence of life in the distant future ... if intelligent life were operating on a cosmic scale before any black holes reach their explosive state, these beings could intervene to keep the black holes from exploding ... Thus, ultimately life exists in order to prevent the Universe from destroying itself! ... ". If one is willing to entertain this possibility, then it is difficult not to make the inference that self-preservation is a goal of the Universe (as it is a goal of each species) and that the evolution (if it exists) of the universe is oriented to at least this goal.

Again, Dr. Brun asserts (p.7), "If evolution drives towards increasing complexity, self-consciousness has to be expected." Now, if self-consciousness "has to be expected", then, I claim, it is built into whatever process

brings it about. Evolution, if it exists, may not know what it's doing. It's just a process, after all. But the One Who set it in motion evidently did know. When I pour water from a pitcher into a glass, the water merely follows the "laws" of dynamics. The "process" doesn't intend the water to end up in the glass. It could just as well end up on the floor (and sometimes does, in my house), as far as the process is concerned.

We can agree, at least temporarily, that the actions of nature are unknowing: the collision of two particles, as collision, is not teleological. But that doesn't mean that there is not an active purpose behind nature, which manifests itself within nature as well. All of the various actions of the "smart bomb", as it speeds unerringly to its target, are in fact "dumb". But there is a purpose behind the flight of this bomb; and this purpose even makes use of these various "dumb" events and "dumb" processes to course-correct the flight, so that the purpose is realized.

To the scientist, observing this process, but who has no knowledge of the purpose (or, intentionally excludes purpose from his consideration), the flight appears to be solely the result of dumb process. And this realization reminds of what may be the biggest "gap" of them all: "complexity" is not identical with "information", nor does complexity entail information. In his *Touchstone* article, Paul A. Nelson recalls Jacques Monod's assertion (in *Chance and Necessity*) that, in their reproduction and development, living things call on vast stores of information ... "whose source has still to be identified: for all information presuppose[s] a source." We notice that, in the "smart bomb" example, process carries information; it does not produce information.

Part of the confusion may stem from Dr. Brun's apparent belief that the influx of energy is sufficient to bring about self-organization in a system. The influx of energy is necessary for a system to transition to a new dynamics. But the influx of energy is not sufficient. The system must be inherently self-organizing for the transition to result in a new, stable dynamic.

But, let us probe further. Does self-consciousness follow from complexity (and, inevitably, as Dr. Brun argues)? Is complexity that which effects self-consciousness? This is questionable. One expects that God and other pure spirits are self-conscious. Yet, we are told, these are simple.

Furthermore, if evolution exists, and if it is a random, undirected process, and if it results inevitably in complexity, then why is complexity so astonishingly localized? In the vast universe, complexity is confined to Earth. How do randomness and undirected process ac-



count for the extreme localization of complexity that we observe? We would be wise to heed the counsel of Christopher P. McKay, reviewing the book, "Rare Earth: Why Complex Life Is Uncommon in the Universe" in *Science* (Vol. 288, 28 April 2000). McKay writes: "We should let our quest (for life in the universe) be guided by our theories of life and evolution, but we should try not to be constrained by them — they may be wrong. In this spirit, *Rare Earth* provides a sobering and valuable perspective in just how difficult it might be for complex life and intelligence to arise."

On the same page (i.e., p.7), Dr Brun quotes approvingly Descartes' assertion that "... there must be many changes in its (i.e., matter's) parts which cannot ... properly be attributed to the actions of God, because he never changes ... ". As it stands, Descartes' rationale would seem to preclude creation in the first place. If God does not intervene in history, then praying for temporal needs is a waste of time. And yet this has been a Christian practice for millennia. Furthermore, if God does not intervene in history, what are we to make of miracles?

Another comment, by an authority, which Dr. Brun finds to be supportive, is Einstein's insistence that "God does not play dice"? Yet, we are supposed to be perfectly comfortable with the notion that nature plays dice. If the context of Einstein's statement is taken into account (i.e., *contra* the probabilistic interpretation of quantum mechanics), one realizes that he was saying that there is no playing of dice at all, neither by God nor by nature.

In making these observations, I don't intend to defend process theologians, such as Gregersen (whose theories Dr. Brun criticizes). I'm only pointing out that there's something inconsistent in allowing that nature may play but God may not. Perhaps, as Phillip Gold is quoted as saying (in Stephen C. Meyer's *Touchstone* article, "Word Games"), "God plays scrabble."

As Christians, who are also scientists, we cannot ignore Scripture's numerous instances of God's intervening in the physical world to achieve His purposes: the plagues of Egypt, parting of the Red Sea, manna in the desert, and so forth. Evidently, God can, and has, and does, intervene in the natural process to smite, to save, to heal, to warn, etc., etc. Are these unique instances? Or are they only dramatic examples of a perhaps pervasive, but usually less evident, involvement?

One does not need to be an adherent of process theology to believe that God can, has, does and will continue to act in the world, without compromising any of His perfections. Critics object: If God cannot act in

the world to prevent evil, then He is not omnipotent; if He will not act in the world to prevent evil, then one questions His goodness. The traditional answer to these challenges asserts that God permits, not causes, evil in the world, and brings good out of it. The critic presses the issue: If God is all-knowing and omnipotent and all-good, and if He acts in history, why didn't He steer us around massive cruelties, such as the genocides of the twentieth century? At this point, we are faced with mysteries of sin, justice, reparation and our connectedness. I suppose that, more fundamentally, one could ask: Why didn't He steer us around Adam's Fall? Perhaps it was because He created us with free will, and there is little or no dignity in freedom if there are no real consequences of our choices. (Although He didn't steer us around The Fall, He certainly acted to course-correct our journey through time.)

Like Dr. Brun, I don't equate salvation with evolution. However, I do think that God acts to correct the courses of our lives, to keep each one of them on the "attractor" of His plan, His individual plan, for each one of us. Evidently, we have the freedom to break from that attractor and lose our souls. I think that nature is allowed some latitude in developing itself. However, unlike man, nature cannot break free from its attractor. Do I think that the development of nature proceeds according to a plan conceived by God? Yes, I do. For example, I think that God planned that there be two sexes ("... male and female He created them").

Dr. Brun sees the parents' joy in "... their children becoming themselves ..." as an analogy to God "... letting the world become itself ... ". Well, the child is not a *tabula rasa*. There are certain constraints (perhaps "soft" constraints), or determinants, involved with its development and its history (heredity is one). And any parent who does not guide and course-correct that development is unworthy of parenthood. Finally, which one of us has not experienced the course-correcting action of Providence in our lives? God may not plan the fall of every sparrow. But this does not mean that He didn't plan that there be sparrows in the first place.

Some may wish to find a precursor to human freedom in the "randomness" of evolution (if it exists). But there is no dignity in randomness. The existence of human freedom strongly suggests intervention (since human freedom does not fall under either category: randomness or determination). Randomness is not freedom. In fact, from the point of view of freedom, there is no difference (at least as far as dignity is concerned) between randomness and determinism. Evolution, if it exists, is not choice.

God surely uses the historical process to facilitate



conversion. He may also adapt this historical process, in a continuing effort to effect salvation, as the course of one's life changes (the "Hound of Heaven"). Salvation is offered in the historical process, that is, using the historical process. Scripture recites many instances of God's intervening in history prior to the coming of Christ. God may not be " ... altering the course of history by interfering with the "laws" of sociology and politics ... ", as Dr. Brun declares. Perhaps not. But by creating human nature, God has entailed what these laws will be.

Finally, we briefly consider Dr. Brun's assertion: "It is (safe) to say that the most fundamental law of nature is universal evolution ... the various laws of nature, such as gravity or electromagnetism, are a result of evolution too." This seems quite a leap. One cannot but suspect a too ready acceptance of the claim that, although evolution remains an unproven theory, it is nevertheless

a fact. One asks: Did nature give itself the fundamental "law of evolution"? If so, how? But if God gave nature the "law of evolution", why not other laws as well. The existence of those many, irritating "anthropic coincidences" indicates givenness (of both laws and design).

#### References:

1. Brun, Rudolf: "Genes, Evolution, And The Word Of God In Creation". *ITEST Bulletin*, Spring 2000, Vol. 31, No. 2.
2. *Touchstone, A Journal of Mere Christianity*, July/August 1999, Vol. 12, No. 4.
3. *Science and Faith, Proceedings from the Twenty-First Convention of The Fellowship of Catholic Scholars*. St. Augustine's Press, South Bend, Indiana, 2001.
4. *Science*, Vol. 288, 28 April 2000.
5. Barrow, John D. and Frank J. Tipler, *The Anthropic Cosmological Principle*, Oxford University Press, New York, New York 1986.

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## THE WORD OF GOD IN CREATION: A RESPONSE TO DR. J. CYRIL HANISKO

**Dr. Rudolf Brun**

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First I express my gratitude to Dr. J. Cyril Hanisko for taking the time to critique my article. I am thankful to get a response, especially one that skillfully summarizes the main points I tried to make in my paper.

"Thanks!"

I'm also thankful to Father Robert Brungs, President of ITEST, for the opportunity to respond. I suggest doing this by first bringing to light the thesis for my thinking about modern science and "The Word of God in Creation." I do this to explain and contrast my position from what I understand Dr. Hanisko's view to be.

In the second part I'll respond to particular issues on which we disagree.

I'll conclude by expressing the hope that understanding creation as God's presence of existence to the world may be a way to update the Christian theology of nature. Perhaps this view will open safe passage between Scylla and Charybdis of process theology and "intelligent design." Such a passage must exist, for the Holy Father forcefully declares to theologians, philosophers and scientists that there is just one Truth!<sup>1</sup>

The Word of God in Creation:

Thesis: "Creation reflects the Trinitarian Creator."

Christianity asserts that God is love. Creation, therefore, must be the expression of this love. God is existence. In the beginning, before creation there is nothing (no-thing) outside of God. God is existence, absolute existence not limited by some other existence that He is not. God is therefore freedom, not restrained by some "otherness" outside of Him. Otherness cannot restrict God because "otherness" is within God. This "otherness" of God within God is God the Son, united with The Father in the Holy Spirit (Hegel, [1827] 1970, 204).<sup>2</sup>

God, however, out of His love and goodness wanted to share existence with what-is-not God and so created creation out of no-thing. *Creatio ex nihilo* is central to the Christian understanding that God is free. It is also central for the understanding of the relationship between the Creator and creation. Creation originates in the love and freedom of God and has therefore no existence in and of itself. Creation exists but not as absolute existence but as given existence. From the Christian perspective, therefore, creation is a gift,



namely God's gift of existence, to what is essentially not God: creation.

The gift of God to creation is His Word, in which and through which creation is. This Word of God is God, namely the Son of God. He is the "otherness" of the Father within God. The Word of God that *is* God becomes creation that *is not* God. To stay with Hegel's formulation: The "otherness" of God *within* God, God the Son, becomes the "otherness" of God *outside* of God: creation. How God can be what is not God, surpasses human understanding. It is the miracle of incarnation, the miracle of Christmas. That God is present in all that is in the mode of absolute otherness is beyond our understanding. It is a good paradox, however, because it might be a glimpse into what it means to believe in God Almighty!

The Word of God is the gift of the Triune God through which creation is. God is absolute, Trinitarian existence. God is one as Father, Son, and Holy Spirit. God is existence as unity in diversity. The thesis for what follows is that God's gift of existence to creation reflects the nature of the Giver. Therefore created existence reflects the eternal, absolute existence of the Creator. This is why all created existence has the ontological structure of unity in diversity. Why is this the fundamental structure of created being? Because the Creator's gift of existence reflects the Trinitarian existence of God.

Before I shall try to anchor modern cosmology in this theological and philosophical foundation, the verb: "to create" needs to be clarified (I hope I watch my language this time!).

I fully agree with Dr. Hanisko that only God can create *ex nihilo*. Creation, instead, can only create out of what already exists. Creation (nature) is dependent upon elements that are already there, it cannot create building blocks out of nothing.

Fair enough!

It is, however, also true that nature can bring forth new things, to create. Not *ex nihilo*, I agree, but through the creative process that brings forth novelty by unifying elements. Why can nature create in this way? Because nature of nature is the Word of God in the "otherness" of creation. Because of God's Word given to creation, creation is creative and does create! With this understanding of the verb, "to create," I hope to have clarified why and how I shall use it.

Two main points of disagreement.

As I understand Dr. Hanisko, there are two main points on which he disagrees with me. He thinks that "the development of nature proceeds according to a plan conceived by God." My position is that nature has to become itself through natural law not through supernatural guidance. Furthermore, Dr. Hanisko's view is that I understand evolution to be "all-embracing." Indeed, I do. I cannot share his view that there is some (weak) anthropic principle that guides nature towards bringing forth life. He writes: "... a life-giving factor lies at the center of the whole machinery and design of the world."

Whether there is some vital force that is guiding nature to bring forth life is an ancient view. There is a broad and a more specific version of vitalism. The broader view suggests that a vital force brings forth life and is also at work in organic evolution. The narrower understanding claims that a vital force guides the development of embryos from the fertilized egg to the adult. I would like to discuss this more specific form of vitalism first.

At the beginning of the twentieth century vitalism was seriously considered by quite a few biologists. These embryologists wondered how it could be that an embryo at the two-cell stage could be separated and still into two individual cells yet each cell could still produce a complete adult. Why did the two isolated cells not just produce two "half" embryos? What was the "force" they wondered that could rearrange each half so that it could develop into a whole? No machine was able to do that. These embryologists therefore postulated the existence of a vital force that somehow rearranged the parts to make them wholes again. In contrast, the "mechanists" rejected such an explanation and claimed that this phenomenon of regulation could be understood in mechanistic terms. They discovered that factors necessary for normal development were symmetrically distributed in the egg. As long as each separated cell had all the various maternal factors, it could develop normally.

The phenomenon that isolated cells from early embryos can regulate and develop into normal adults is used today generate multiple animals. Early embryos can be disassembled into single cells that then are implanted into foster females. The result is multiple "twins" that originate (like genuine human twins) from only one fertilized egg.

The phenomenon of emergence

Does this mean that the materialists were right and the vitalists were wrong? I don't think so. There is a principle involved here that makes it possible to harmonize mechanistic thinking with life: it is the principle of emergence. Emergence is the ubiquitous yet astonishing



phenomenon that wholes are more than their parts. We mostly focus on the quantitative — not the qualitative — aspect of this axiom. Wholes have qualities that do not exist in their isolated parts. Wholes have Gestalt qualities. For example, the quality of liquid water is not present in its gaseous elements hydrogen and oxygen. The synthesis of hydrogen and oxygen brings forth water, molecules that have totally new qualities. Both gases are not liquid at room temperature, don't freeze at 0° C and do not evaporate at 100° C.

There is still another amazing aspect of synthesis. It is that the laws that govern new gestalts emerge together with new wholes. The physical laws that govern the specific behavior of water would not exist in a universe in which there would be only oxygen and hydrogen. Emergence, however, is not limited to the physical world. It is also the fundamental phenomenon that brings forth life. Life is a quality that emerges in the creative event that integrates non-living entities into the first forms of life. We can verify this by dissecting a primary organ, a bacterium perhaps, into its elements, organelles, proteins, molecules, all the way down to the level of atoms. Yes, this is a reductionism because there is disassembly on a unit into its parts. With this dissection, life is gone but there is also a great discovery. It is that all the parts are wholes themselves!

Here is what I consider to be the most exciting discovery of modern science. It is that the further down we dissect any organism, the age of its parts increases: cells are older than tissues, organelles are older than cells, proteins are older than organelles, molecules are older than proteins and the atoms integrated into molecules are older still. What does this mean? It means that life emerged from a sequence of synthetic events, from the synthesis of atoms into molecules, the synthesis of molecules into proteins, the assemblage of complex organelles from proteins and the fusion of organelles into the first living organisms that later became integrated into cells. Of course we don't yet know the details of the environments that made possible all these successive levels of synthesis. For example we are badly lacking in the understanding of how nature assembles organelles. The reason is that they are too big to be understood by quantum mechanics and they are not numerous enough to understand their behavior through statistics.<sup>3</sup> It will be necessary to understand the natural laws that govern this level of self-organization to understand the origin of life. In high-school physics we learnt that ordered systems left to themselves tend to become disorganized. Any system spontaneously moves towards equilibrium, towards random distribution of its constitutive elements. Disorder (entropy) increases and structure is lost. Why? Because even the maintenance of structure (order) requires energy. From this second law of thermodynamics

the universe should disintegrate, loose structure, not evolve into increasingly complex entities. Is there some force that pushes the universe uphill? Yes, there is. It is the energy left over from the original explosion of the Big-Bang that makes evolution possible. The emergence of life is not the result of some vital force but the result of sequential self-organization. Life emerges from the sequential synthesis of elements that were previously synthesized. Life is the result of this self-similar creative process capable of forming increasingly complex entities thanks to the energy left over from the original explosion of the Big-Bang.

The point is: vitalism in its narrower and broader version is dead.

Nature is creative and therefore inventive. The term "invent" is therefore not just an alias as Dr. Hanisko claims. Nature, however, does not invent the way we do. Nature does not invent for a purpose but by tinkering. If the result of tinkering is stable within the given environment, it might serve as an element for further tinkering. Each new stable state opens a landscape of new possible stable states. It is crucial here to see that this landscape of possible states does not pre-exist. The landscape of possibilities emerges together with the probabilistic historic process. It is this process that brings forth new options in the future. At the same time a possibility becomes reality in a creative event, the horizon in which the possibility was a part shrinks and freezes into just the one event that really happened. Nature can move through the landscape of possible stable states thanks to the energy released in the Big-Bang explosion. Evolution on earth, for example, is only possible because of the energy that radiates from the sun. The sun, however, is a star that takes its energy from hydrogen [of] that original explosion.

Possible states in the landscape of possibilities are reached when the elements nature tinkered with self-organize. Self-organization arranges existing elements into new entities with emergent properties. Nature sequentially synthesizes new wholes in this way. Teilhard de Chardin was precisely right: it is synthesis that brings forth novelty.

In this view, there is no good reason for excluding the human mind from the natural, creative process. The human mind emerges from the integrated complexity of the human brain which is a result of hominoid and vertebrate evolution.<sup>4</sup> We know today what can happen when the brain malfunctions, schizophrenia and Alzheimer's disease are just two examples. Fortunately there are drugs that can restore the normal chemistry of the brain and with it the mind. I mention this to illustrate the dependence of our mind on the proper



physico-chemical and anatomical integration of all its elements. We don't yet understand how the mind emerges from its united parts. Some claim that we shall never understand how this can be — others are not so sure, myself included. Will there be "machines" that can not only think but also feel?

Of course the temptation is great just to dismiss such a naturalistic understanding of the human mind. After all, are we not created in the image of God? Did we not receive from the Creator an immortal soul in which our mind and spirit must have their common origin? In my view we must overcome the dualistic understanding of mind and body, form and matter. This should not be too alien to Christian thinking because Christians must take the incarnation seriously. The Word made flesh — the Spirit incarnate, the mind in the otherness of "matter." The mystery of incarnation could just be the link that reasonably connects Christianity to modern science.

Teleology?

Because nature is creative through the sequential integration of elements, it is possible to disassemble any unit into its parts. By doing so we discover that the parts are unities themselves. From the human mind down to the simple forms of life, and further down to molecules and atoms, all these units were brought forth by nature through the same, synthetic process. Atom smashers provide insights into the architecture of atom-building elementary particles. These emerged from the energy released in the Big-Bang, from energy that froze into matter. Not continuous or punctuated supernatural action shaped matter into stars, galaxies, and solar systems but the natural creative process did.

Nature brings forth new entities step by step. Creation has no alternative because creation is in time. This is why there is a natural history, a sequence of events that goes back to roughly 12 to 14 billion years. Nature comes into reality through its own history, through the events that became reality through this essentially probabilistic process.

Astronomers, for example, can get a glimpse into how stars form. In enormous gas clouds, light years in diameter, they may form from areas in the cloud that by chance are slightly denser. Those attract matter from the surroundings that make the center's force of gravity even greater. As it attracts more and more matter, friction generates enormous heat. It ignites nuclear fusion in the center of the forming star. The centrifugal forces generated in the nuclear furnace counterbalance gravity's pull. This leads to an equilibrium between the centripetal and centrifugal forces: a star is born.

As the star ages it depletes its nuclear fuel and collapses. The collapsing matter might generate so much heat that at first the shrinking star explodes. If this happens, its matter spews into outer space. There it forms a cloud again that now contains the newly synthesized atoms generated in the nuclear furnace of the vanished star. The center of such a new and younger cloud may become a star again and the matter at the periphery of the cloud might coalesce into planets.<sup>5</sup> Our solar system formed this way.

Since there are uncountable numbers of stars there might be uncountable numbers of planetary systems in the universe. By chance planet earth is just at the right distance from our star, the sun, so that liquid water can exist. As far as we can tell, water is essential for the evolution of life. We are looking back into this history of chance events and conclude that the process must be guided towards us.

In my view, the Anthropic principle to which Dr. Hanisko seems to subscribe is an illusion. It is partly due to a fallacious understanding of time as watch-time. Watch-time is an abstraction from real time. It claims that the time of the past and the time of the future are the same, that the abstract time  $t$  of physics represents all time. The time of the future, however, is essentially different from the time of the past. Future time is open to the horizon of possible events, the past, however, is closed. The horizon of possible events has vanished into the linear sequence of the frozen past. The anthropic principle is misguided because it claims that the future is a linear extension of the past. It ignores that at any moment the direction of the creative process may change depending on which of the possible outcomes becomes reality. Cosmogogenesis is a probabilistic, stochastic process, not on the way to a predetermined end.

The view that the universe is moving along a predetermined path came into Western thought from Greek philosophy, especially the philosophy of Aristotle. In his view, the cosmos was an organism. A chicken egg, always develops into a chicken, a frog egg always becomes a frog not a fish. The end, a final cause Aristotle claimed, must already be guiding the process from [the] start; how else could the end be predicted from the start? Aristotle projected his understanding of final causes that guided embryogenesis unto the universe. Some leaders of the Church embraced Aristotelian physics. It seemed to beautifully support the understanding that the world was oriented towards reaching its goal set by the Creator. Physics confirmed the doctrine of divine providence.

Galileo showed by experimentation that the physical universe is not guided by final causes but by initial



conditions. That, perhaps, was Galileo's real problem with the Church. The modern version of "correct initial conditions" asks the question: "is the universe on a predetermined track because its initial conditions are just right?" Some physicists suggest indeed that the parameters of the original explosion were fine-tuned to bring forth life. This is the weak version of the Anthropic principle (weak AP). Others go further and want us to believe that the Big-Bang was fine-tuned to bring forth human beings (strong AP). The anthropic principle in either form is a variation of the old argument from design. There is design in nature therefore there must be a designer, the universe is fine-tuned therefore there needs to be a tuner. Dr. Hanisko goes one step further. He suggests that the trajectory of the universe might be analogous to a smart bomb. The universe is smart, it can find its target even after accidental deviations from its original course.

In my view these models of how the universe works do not take the probabilistic nature of history seriously. The universe does not follow a trajectory similar to a fired artillery shell, a rocket, or a smart bomb. It rather traces an essentially probabilistic pathway similar to a ball's trajectory in a pinball machine. As the ball hits the pins at various speeds and angles its pathway changes unpredictably into new directions. The ball is pushed up the slope by the energy it obtains from the flippers. The universe can move up the slope of morphogenesis thanks to the energy released in the Big-Bang explosion. Yes, nature does bring forth novelty. It does so, however, by following a probabilistic path not a deterministic way. Universal evolution is a process that increases complexity in probabilistic ways. The process is not teleological but teleomorph.<sup>6</sup>

If some structures of nature look "irreducibly complex" and therefore "designed" it looks that way because our knowledge of how nature works is still fragmentary. There are (natural) laws of self-organization that science has not yet uncovered. True, we still don't understand how life emerged on earth and possibly elsewhere. True the complexity of a cell boggles the mind. To "explain" complexity as the result of design makes the designer the God of the gaps again. Experience tells us that such a "solution" does not hold up. How nature works has been and always will be explained by the laws of nature not by supernatural intervention through intelligent design.

Some theologians like the suggestion that there is an anthropic principle and/or intelligent design in nature. They like it because this view of some physicists, biochemists and mathematicians seems to demonstrate that the providence of the Creator can be documented by science. The headline reads: "Faith Confirmed By

Science!" The faith of Christianity, however, is not in science but in Jesus Christ. *He* is the providence of God because in Him creation is created and saved. God eternal creates and saves in one creative act, not in time. It is from our perspective within time that creation and salvation appear to be sequential events. The center of Christian faith is that in Christ, the love of God is with creation for all times, not through a process that brings the world closer to him. If the world is designed to reach God through its own dynamic, Christ's life, death and resurrection are meaningless. As I see it, this is the deep reason why a Christian theology of nature must reject anthropic principles (and process theologies) of all varieties.

The response to the love of God that appears in Jesus Christ is at the center of Christian life. This response, however, must be given freely. The freedom to either ignore or accept the loving relationship with God is essential because love cannot be imposed. We know today deeper than at any other time that our roots are in nature. Nature, however, cannot bring forth creatures that are free if creation must execute God's design. Nature cannot be designed to bring forth freedom because such a "freedom" would be the designer's freedom, not nature's! A world upon which a designer imposes his design cannot become itself. Furthermore, if there is no freedom there is also no responsibility, including the responsibility for doing evil.

Yes, I do accept an "all-embracing evolution" as Dr. Hanisko puts. For reasons that I have just tried to explain, I cannot see an alternative, not from science and even less from a Christocentric theology of nature.

Some further issues raised by Dr. Hanisko:

The evolution of developmental programs.

Modern molecular analyses of the genes that control embryonic development provide a surprising result. Genes of widely different organisms such as fruit flies, frogs, mice and human beings are surprisingly similar. Therefore the difference between these organisms is not so much due to different genes but is due to how they interact with one another. I explain this to my students by making an analogy with playing music on a keyboard. The genes (keys) are the same but the music (organisms) can be very different.

In the section: "The evolution of developmental programs" Dr. Hanisko correctly describes what I suggested. He is right to point his finger on the difficulty to understand whether "this process of duplication takes place within a single embryo time span or if it covers generations with the duplicated program inherited along



with the original program." I don't see the possibility of this process to take place within a single embryo. Rather, a duplicated program might become inherited over many generations without expressing its information. It might become active through a mutation in the original or duplicated gene sequence. Through a mutation a signal might become different and in this way capable of connecting the two programs.<sup>7</sup> Perhaps such an event could happen during oogenesis. We know that maternal programs present in eggs are of crucial importance for the correct development of embryos. This is so in a wide variety of organisms. I'm not claiming we know the details of how new developmental programs come about in evolution. What we do know, however, is that significant evolutionary change cannot happen in adults but must occur in development. Dr. Hanisko is right to point out that modularity (the recruitment of similar programs for different tasks) is efficient. We are on the way of understanding that nature used modularity to generate radically different organisms. For example there are closely related programs involving position determining genes (Hox-genes) that control the antero-posterior polarity of the entire body axis, the antero-posterior organization of the head, hind and fore-limbs and possibly other organismic parts. We also know that these programs evolved through duplications.<sup>8</sup>

"Survival of the fittest"

Darwin's view of variation and natural selection as the mechanism of organismic evolution has held-up pretty well since 1859, the publication of *The Origin of Species*.... I don't know of any evolutionary biologist that contests the importance of natural selection. Darwinism needs to be expanded but not abandoned. The insights from molecular biology just sketched were, of course, unknown to Darwin. We might find out that synthesis is at work in the construction of programs that might bring forth new organisms. It might therefore be that the gradualism that Darwin emphasized for the evolution of species might not strictly apply for the evolution of new animal blue-prints (phylogenesis). Of course we don't know yet how this works in detail. On the basis of the arguments presented above this is, however, no reason to bring the old anthropocentric argument from design into modern science.

Does God act in Human history?

Of course He does! God is with us for all times. God's eternity includes time — but lets time be itself. God acts in history through the human beings he has known "before they were born in their mother's womb." God takes His People seriously at all times. The task to change the world, however, is ours. Prayer is essential,

I agree with Dr. Hanisko. Without being open to the Holy Spirit we will try to change the world according to our will, not the will of the Father. Do I believe in the miracles God worked for the Israelites, "parting of the Red Sea, manna in the desert, and so forth?" I believe that the Israelites experienced the presence of God through their history. History for them was the revelation of God's will for His chosen people. History was the sign that God fulfilled the promise given in the Covenant. History, therefore, had a deep religious meaning. The question whether this religious understanding is in all aspects congruent with events as we understand history, I must leave to the experts to answer.

Does self-consciousness (inevitably) follow from complexity?

My answer to this question is an unqualified: "yes." Life emerged on earth within about 500 million years. The universe is billions [of] years old. That is plenty of time for life to evolve elsewhere. Whether conscious or even self-conscious life evolved elsewhere in the universe is a different question. The answer so far must be: "We don't know." What we do know, however, is that we human beings have been brought forth by nature. We also know that our self-consciousness is anchored in the complexity of our brains. Self-consciousness present in the experience of "I" is the result of complexity, yet (mostly) we are not aware of it. The "I" is simple but it is a simplicity that results from integrated complexity, from united diversity.

Some philosophers of old saw all that exists as "oneness." I suggest that they were right! Creation, which includes the human mind, exists as united diversity. Because the mind is an integrated "one" it is simple, because it is rooted in complexity, its is also complex. In this view, genuine simplicity is always complex: "simplex!"<sup>9</sup> Therefore I submit the thesis that the "simplicity" of creation reflects the Trinitarian "simplicity" of the Creator. Creation is the gift of God, it reflects the nature of the giver. It reflects the Creator who is "unity in diversity," who is "simplex" Trinitarian existence as Father, Son, and Holy Spirit.

By thinking about the relationship between the Creator and the world, the notion that creation is God's gift might be useful. Faith must seek understanding. Christianity must make sense for all times, including ours. We need to find a way to integrate the exciting discoveries of modern science into an updated theology of nature. The Holy Father, John Paul II urges theologians, philosophers, and scientists to listen to one another and continue the work *together*.<sup>10</sup>



## References:

1. *Servants of the truth*. Discourse of Pope John Paul II to members of the American Philosophical Society and the Italian 'Accademia dei Lincei', 21 May 1996.
2. Hegel, G. W. F. [1827] 1970, *Philosophy of Nature*, Edited and translated by M.J. Petry, London: Humanities Press.
3. "Science's Elusive Realm: Life's Little Mysteries." Article by Sandra Blakeslee, *New York Times*. 24 April 2001.
4. John H. Kass and Christine E. Collins: "Evolving ideas of brain evolution." *Nature*, vol. 411, 10 May 2001, p. 141.
5. See on the internet: <<http://hubble.stsci.edu/news-and-views/pr.cgi.2001+13>>
6. My term.
7. Eors Szathmáry: "Developmental circuits rewired." *Nature*, vol. 411, 10 May, 2001.
8. Ilya Ruvinsky and Jeremy J. Gibson-Brown: "Genetic and developmental bases of serial homology in vertebrate limb evolution." *Development* vol. 127, 2000, p. 5233  
Axel Mayer "Hox gene variation and evolution." *Nature*, vol. 391, 15 January 1998, p. 225.  
Angel Amores et al. "Zebrafish hox Cluster and Vertebrate Genome Evolution." *Science*, vol. 282, 27 November 1998, p. 1711.
8. John Paul II on "Science and Religion." Robert John Russel, William R. Stoeger, S.J. and George V. Coyne, S. J. Editors. *Vatican Observatory Publications*, 1990, and *The University of Notre Dame Press*, Notre Dame, Indiana 46556.
9. Mr. Stratford Caldecott, Editor, T and T Clark Publishers, Oxford, England, suggested this term to me.
10. Pope John Paul II, *loc. cit.*

For a time we open these columns to further argument to all who would pursue them. Since the original article was published over a year ago, you may have discarded the issue in which the article (*The Word of God in Creation*) was published we shall endeavor to put it on the Web Page (<http://ITEST.slu.edu>) in the next couple of months.

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### GUEST EDITORIAL FOR LOVE OF TEACHING by John L. Hubisz

What is it that turns otherwise reasonable individuals into physics teachers? I really don't know, but after listening to colleagues' stories over the years, I see that many of us came into the profession via rather unique routes — a mathematical physicist who failed algebra, a graphic artist who sought better answers, a novice biology teacher required to teach physics who stuck with it — and each one of us has a story to tell. Perhaps my own adventure might give some insights into how we teachers (and parents and uncles and aunts) might stimulate students' interest in following in our footsteps. It's a path that winds from kindergarten through graduate school.

Word play seems to be universal among physicists, and learning to make connections among seemingly diverse pieces of information is good preparation for physics teaching. My Uncle James, who was the first to tell me

why fire engines were red, always had a puzzle for me to solve. His hobby was that of a "professional" collector of strange bits of information, which he sold all over the world. When he died a few years ago, he had a collection of over 5 million magazines. Growing up, I spent hours sitting on the floor of his warehouse, poring over his eclectic collection. Our house was well supplied with puzzles and games. My early memories include playing "Twenty Questions" and "Hangman" with my Parents. Doing crossword puzzles was family entertainment. Now I make up crossword puzzles dealing with physics and math concepts for my students (it's easy with a computer program!). I gave myself extra points a couple of months ago when I decoded North Carolina license plate PTZ 178 as "Peter Kapitza, Nobel Prize in 1978."

Middle school is the time and place to capture the



scientist in a youngster. Sister Helen Dorothea was my teacher in both fourth and sixth grades. Apparently the teacher scheduled to teach sixth grade refused to take our class, so Sister Dorothea took the assignment. It was a lucky swap for the students. She had us solve all the word problems in our texts and presented us with many more from other sources. She had us work through logic puzzles, creating an atmosphere of fun and competition. Whenever one student finished a task and got it correct, that student was sent to help another. This was an early lesson for me: trying to teach someone else increases my own understanding. Sister Dorothea told me I would love calculus, that I should become a scientist, and that I would make a great teacher. In my classroom I allow students credit for helping fellow students; I encourage my class to work in groups. Experience tells me that the whole class benefits.

When I signed up for plane geometry, Brother Harold was my teacher and I thought he was great. The only other course he taught was physic, so I took it. He was still great. We did experiments outdoors. We solved problems following a pattern that I now require my students to follow. And the concept of working together was reinforced, but with a twist. Very early one morning I was helping a fellow student with the assignment from the day before and forgot to pick up my own copy. Brother Harold came to class with both homework pages and tore them up in front of us, pointing out that "Both the one who copies and the one who allows it are in the wrong." Now I require students that

I help to write down their own response to questions I ask. My stock response to their "Do you always answer a question with a question?" is "What do you mean?"

Six weeks into my first year in college (17 years old, six inches shorter, and 110 pounds lighter than I am now), I was given credit for my first year, made a sophomore, and began teaching the laboratory that I had just been in. I knew that the students were not preparing in advance, so I made up a half dozen questions about the lab. Any student who could not answer two out of three questions could not get into the lab until they went to the library and reviewed the lab instructions. They complained to the department head; he suggested they go to the library. I was hooked! I took on more labs. Before I graduated from college, I taught a high school physic class to help students complete a course when their teacher died.

I kept teaching at the university level and did graduate work in my spare time. I did theoretical work in various branches of spectroscopy, inventing models, predicting transition probabilities, and the like. But that was just a summer job and no competition for the classroom.

Forty-five years later, I'm still in the classroom, still reading day and night, still composing puzzles and games, and finding answers to arcane but interesting questions. But more significantly, every day I look at the young people in front of me and I realize that something I say or do may well point a student to a career in teaching. I relish the opportunity!

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### "MEET YOUR NEW PRESIDENT"

*[Doctor John Hubisz is a faithful, long-time member of ITEST and Professor of Physics at North Carolina State University at Raleigh. Also a Deacon in the Catholic Church John is a veteran in the dialogue between Faith and Science. This article first appeared in The Physics Teacher, Vol. 39, #2, (c) 2001 American Association of Physics Teachers.]*

Take a short drive southwest out of Raleigh, N.C. The Old Apex Road will take you to the once-rural community of Apex, a town that developed at the highest point on the Chatham Railroad Line. The railroad tracks run parallel to the main street of downtown Apex. As you head south out of town and turn off onto one of several unpaved roads, you'll find yourself winding your way to our AAPT President's home. John Hubisz and his wife, Jola, affectionately call their home and surrounding property Hubisz Hills. Their home is tucked away among the North Carolina pines far from all of the usual trappings of suburban Raleigh living, and the farmlike setting is a wonderful place to chat about physics education with John. The hideaway home's re-

markable for many reasons, but the most notable is John's library, which reflects a lifetime of scholarly interests. Just ask him about it sometime and a smile will cross his face. He delights in sharing the details of this impressive collection and no doubt will invite you out to visit if you're ever in the area.

John's teaching experience began, like many physicists, as a physics lab instructor. He taught at St. Francis Xavier University in Nova Scotia, Canada, where he also completed his Bachelor of Science in physics and mathematics with honors. He received his M.S. degree from the University of Tennessee and his Ph.D. in physics and space science from York University and the



Centre for Research in Earth and Space Science in Toronto.

Since entering physics teaching early in his career, John has taught across North America in Knoxville, Toronto, Texas City, and Raleigh. His colleagues at College of the Mainland in Texas City, where he spent 22 years of his career, honored his dedication and talent as a teacher by nominating him five times for the Minnie Stevens Piper Professor of the Year Award. John presently holds the titles of Professor Emeritus from College of the Mainland and Visiting Prof. of Physics at North Carolina State University. Anyone who knows John realizes that his role as teacher is one that provides him with deep satisfaction. It is a role that characterizes much of how he has lived his life.

When John moved to North Carolina and joined our department in 1993, we didn't imagine the dramatic effect he would have on physics educators in North Carolina. He worked diligently and collegially with officers of the South Atlantic Coast Section of AAPT to separate and establish a new AAPT section in North Carolina. Honored for his leadership in the Texas Section with the prestigious Robert N. Little Award for Outstanding Contributions to Physics in Higher Education (1987), John's long and impressive record of involvement in the Texas Section provided the impetus and rationale for establishing this new coalition of physics educators in North Carolina. In 1999 the NCS-AAPT established the John L. Hubisz Award to recognize outstanding service to the section. Appropriately, John was the first recipient.

His dedication to AAPT includes a list of service on committees and task forces too numerous to name. This service reflects his interest in the physics education of children and his love of history and philosophy of science. He served as the member-at-large on the AAPT - Executive Board from 1991-94 and is remembered by

those on that Executive Board for his thoughtful contributions and his excellent chocolate chip cookies. AAPT honored John with a Distinguished Service Citation in 1990.

A visit to John's classroom reveals his approach to teaching and his beliefs about student learning. Teaching physics is about questioning—questioning what one observes in the physical world. The first time I visited one of John's classes was in the early 1970s, and I remember distinctly how he encouraged students to take responsibility for their own learning. Learning isn't about getting a certain grade. Instead, students in John's classes contract for their grades, each making a commitment to fulfill specific standards that demonstrate their understanding of physics. Learning isn't about knowing a set of "physics facts" or highlighting formulas in a textbook, but requires that you observe and analyze the physical world in a rigorous manner. Just ask John's students. John invites them to read physics from many sources and often shares what he's reading with his students.

In a commentary prior to his election as AAPT Vice President, John reminds us that children "are our hope for an enlightened public who with our help can make the scientific approach an integral part of their lives." Recognizing that most pre-high school students must rely on their science textbooks as a primary classroom resource, John is committed to ensuring good science in these texts. With support from the Packard Foundation, John is currently engaged in a project to evaluate middle school science text-books. Ask John about this important project, and then be sure to ask him about his library. And watch him smile.

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*Washington Theological Union*

Washington Theological Union is a Roman Catholic school for ministry offering master's degrees, graduate certificates, and continuing education programs for men and women, religious and lay, to prepare them for



ministries of service, witness, mission and leadership. The Union's educational philosophy is to teach how the Roman Catholic tradition interplays with contemporary society. Course work and field study focus on the practical applications of how religious beliefs, values, and customs interact with the dynamics of human experiences. As part of this effort, the Union has sponsored public workshops involving scientists and theologians, and has offered award-winning courses examining the relation of theology to the sciences.

Washington DC is a center for American Catholicism, and the Washington Theological Union maintains working relationships with the national offices of the Catholic Church, as well as several interdenominational groups. An active partner in ecumenical education, the Union is a co-founder of the Washington Theological Consortium, an educational and ecumenical enterprise of six Christian graduate schools of theology. This arrangement makes available an outstanding ministry library collection of more than one million volumes.

#### *Housing and Tuition*

The primary site for the program is Washington Theological Union in Takoma Park, Washington, DC. The Union has 45 room available for residents. Costs for room and board and tuition and fees are detailed in the Union catalog and on our website: [www.wtu.edu](http://www.wtu.edu). Financial assistance and scholarships are available.

#### *Advanced Studies in Religion and Science*

Washington Theological Union, a graduate school in the Roman Catholic tradition, has instituted a program of theological studies in religion and science. Beginning in the Fall 2001, courses will be offered toward a *Graduate Certificate* in the field. The Certificate brings together the various disciplines of theological study into a framework for examining questions emerging from the sciences. Available courses (listed below) explore theological, philosophical, ethical, biblical, historical and spiritual dimensions of the religion-science relationship. The program aims to provide students with a firm foundation for theological and ethical reflection while offering opportunities to explore areas of particular

interest. Students can take an isolated course or enroll in the 18-credit hour Certificate program.

#### *Graduate Study at the Union*

Washington Theological Union's *Graduate Certificates* are one component of a multi-faceted Masters Degree-granting program in theology. Certificates can generally be completed in one year. They are intended for persons with college or professional degrees, seeking personal enrichment and/or wishing to deepen their theological knowledge. The *Graduate Certificate in Religion and Science* attempts to meet these interests for persons concerned with and involved in the sciences-religion relation. The program seeks to provide the tools for individual theological reflection and to facilitate productive dialogue between scientific and religious communities; it should be of particular interest, though is not limited to practicing scientists and teachers of science. An ecumenical dimension of the program is provided through the Washington Theological Consortium.

#### *Courses Required for the Certificate:*

PH512 Theories of Reality and Knowledge (3) SY511 Foundations of Theology (3)  
SY512 Christian Anthropology (3)  
EH702 Independent Study: Theology & Science (3)  
Elective courses in area of interest (6)

#### *Choose from following Electives*

EH793 Following Christ in a Scientific Age (2)  
EH781 Ecology and the Christian Tradition (2)  
EH782 Ancient and Medieval Views of the Cosmos (2)  
EH795 Encounters between Modern Science and Christian Faith (2)  
M0770 Ethical Issues in the Sciences (2)  
PS774 Spirituality and Human Development (2)  
SS789 Biblical Faith and Divine Creation (2)  
SY730 Eschatology in Theology and Science (2)  
Additional courses are available through the Washington Theological Consortium, a community of theological institutions of diverse Christian traditions.

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## CONCLUSIONS

**Monsignor Paul Langsfeld**

[The following is an excerpt from "Creation and Evolution," Monsignor Langsfeld's contribution to the ITEST Workshop, *Creation & Evolution*, October, 1997. Monsignor Langsfeld teaches Christology, Trinity, Sacramental Theology and Theological Anthropology at Mt. St. Mary's Seminary in Emmitsburg, Maryland.].



Pope John Paul expressed the concerns that Christian theology has traditionally had concerning the scientific theory of evolution. We identified three issues. First, theology needs to understand the kind of knowledge at stake in the scientific theory and its degree of certitude in relationship to what the doctrine of creation makes known about the world. Second, Christian theology has a particular interest in the implications of evolution for human life, given the prerogatives of human beings as the image and likeness of God. Finally, the ability of Neo-Darwinism to explain the emergence of life in terms of natural mechanism alone raises a question about the place of God in the evolutionary process, and particularly, his ability to perform "special acts" as in the creation of human life or the miracles.

We examined the way contemporary theology has handled these three issues, and came to the conclusion that it is too highly controlled by the perspective of the natural sciences. While critical of Enlightenment theology, it too is highly rationalistic, leaving little room for anything other than a naturalistic understanding of even the Christian mysteries. It goes the way of the "theological functionalism" which views God as something like a "condition of the possibility" of the world. The danger in this is evident when one looks back at the cosmologies of Augustine and Aquinas and realizes how much their scientific views are out of date, conditioned by the knowledge of the day.

Theology has not had a good record in its relationship with science. It has been reactive (fundamentalism), isolationist (neo-orthodoxy), and accommodationist ("immanentist" theologians). Each of these are controlled by the presuppositions of science. Theology cannot get beyond this situation unless it has a proper sense of its own object of study and the kind of knowledge which is proper to it. In order to discover what this might be, we need to come to terms with the meaning of "mystery."

Placher points out that theology has often been guilty of invoking mystery when it cannot find an explanation for something.<sup>262</sup> Science is just as guilty, invoking a "God of the gaps" when it cannot offer a scientific explanation. Mystery, thus, has a bad name. But before modern times, mystery had a positive meaning.

The rationalistic ideal of the Enlightenment led to a dissolution of mystery.<sup>263</sup> The latter appeared to reason to be the refuge of the weak-minded who sought consolation in the darkness of feeling because they could not tolerate the light of intellect.<sup>264</sup> Mystery, then, was understood negatively as everything that remained after reason had accomplished its work, and with the advance of science, even the areas of knowledge still in the shadows could be illuminated. Theology understood the ob-

ject of faith in this context as supra-rational and inconceivable, that is, in a purely negative way. "Mystery was now an impassable boundary for knowledge, rather than the ultimate overflowing of all knowing."<sup>265</sup> In its pre-modern, positive meaning mystery is a fullness of being and knowing, which transcends all human knowing even as it embraces it in its plenitude. Reason itself opens out on to mystery, so mystery need not conflict with reason. Only the Enlightenment understanding of reason regards mystery as competitive because it pretends to a knowledge "within the bounds of reason alone."

It is precisely the fullness of being that the doctrine of creation expresses as it refers us to a whole greater than nature. It is not threatened by natural modes of knowing, and even presupposes them, for creation is not God and thus has a relative autonomy. Yet the doctrine of creation maintains that the origin, sustenance, and destiny of human beings and the world cannot receive a sufficient explanation from any of the natural sciences, either singly or collectively.

In the Bible, creation is associated with the wisdom tradition.<sup>266</sup> This is no accident, for human beings and the world are manifestations of a divine wisdom which remains inscrutable, beyond human understanding. The mysterious character of the world and human beings springs from their relationship to God, who alone knows their inmost secrets. Mystery remains permanently mystery; the modern natural sciences do not dissolve it by forcing nature to yield up all her secrets. The sciences open out on mystery, not just because they come up against barriers that puzzle them, but because of the plenitude implied in mystery.

A truly "postmodern" theology has to get beyond the rationalistic ideal of the Enlightenment which remains that of the natural sciences, despite the more sophisticated hermeneutical appreciation of their discipline which some scientists have. A retrieval of the pre-modern sense of mystery, and not just a return to pre-critical ways of doing theology, would help theology get beyond the rationalism which it has taken over from the Enlightenment. Then it would not have to react to, isolate itself from, or accommodate itself to the natural sciences, but could invite them to be critical of their own understanding of rationality and to place themselves within a broader enterprise of seeking to understand human beings and the world, not just as scientists, but as sages.<sup>267</sup>

Those who believe that the opening of science to mystery leads to the end of science (e.g. [John] Horgan) or to the use of theology to supplement science (e.g. [Stephen] Meyer) are equally on the wrong track. The doctrine of creation frees the world to be an object of



investigation to the sciences, whose understanding of truth is determined by their methods, but the same doctrine maintains that there is another understanding of truth not reducible to scientific categories.

In God and his relationship to the world we have to do with a mystery which cannot be grasped in terms of natural processes without turning God into the highest being in the natural order. To preserve God's radical transcendence, the divine creativity cannot be conflated with the apparent "creativity" of nature. To speak of nature as if it were permeated by a divine intelligence comes close to a deification of nature.

In human persons we also encounter mystery. Despite the modern reduction of person to consciousness, personhood in Peacocke and Mooney retains the connotations of incommunicable uniqueness and transcendence which reflect its theological origins. When personhood is said to evolve, like everything else, from matter, the reason for this is to ensure a naturalistic explanation for the totality of reality and to avoid the specter of Cartesian dualism. Yet a "personalist ontology" need not presuppose a Cartesian dualism, nor does it feel constrained to conform *a priori* to a definition of nature. There is, instead, a plenitude of being implied in the

notion of person which makes the natural categories of evolution inappropriate to articulate it. Unless it can be shown that nature is the whole of things, naturalistic explanations cannot do justice to the reality of God and of human persons.

- 262 Placher, *The Domestication of Transcendence. How Modern Thinking About God Went Wrong*, 126.
- 263 Kasper, *The God of Jesus Christ*, 127.
- 264 *Ibid.*, 269. The category of mystery provided "religious justification for mental fatigue and even intellectual dishonesty."
- 265 *Ibid.*, 127.
- 266 Roland Murphy, *The Tree of Life, An Exploration of Biblical wisdom Literature*. Second edition (Grand Rapids; William B. Eerdmans, 1996), 118-20; 134-35.
- 267 As John O'Donnell explains in his article, "Faith in God the Creator" *Gregorianum* 78/2 (1997):309-28, there are a number of models for the interpretation of creation. He identifies the Christological, ontological, fiducial, eschatological, ecological, and doxological models. We have concentrated in this paper on the ontological, insofar as our concern has been the relationship of creation to the natural order. Yet, the fullness of the mystery of creation must include all the dimensions pointed out by O'Donnell.

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