

PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

In this issue . . .

Neuroscience, Evolutionary Psychology,
and the Image of God

Neuroscience, Theology,
and Unintended Consequences

Dimensions of the Human Being
and of Divine Action

Genetic Prospects: Finding a Balance
between Choice and Acceptance

Challenges & Lessons
from the Terri Schiavo Case

The History of the Dodo Bird
and the Cause of Its Extinction

From Gaps to God

The Two Books Prior
to the Scientific Revolution

*"The fear of the Lord
is the beginning of Wisdom."*
Psalm 111:10

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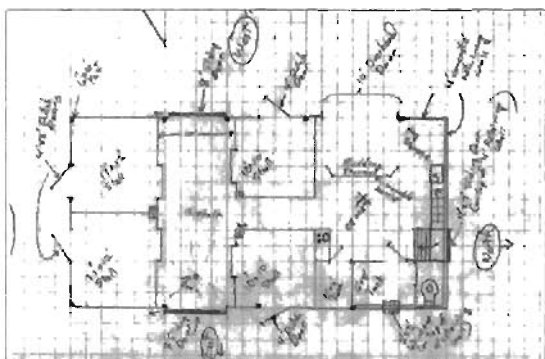
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Creative Barn Building



During the past weeks, Shepherd's Knoll has bustled with workers busily erecting our new horse barn. Conceived several years ago, our construction plan continually evolved as my wife and I debated and discussed options and attributes for this dream horse barn. We settled on the location (east of our house, but well in view), overall size (dimensions 24 feet x 48 feet with 12-foot sidewalls), and basic components (four horse stalls, tack room, a loft, and storage areas for feed, bedding, hay, and tools). In June, our barn building project began with site excavation and then basic structural erection by a local agricultural construction company, who put up the pole framework and metal roof. The balance of the construction remains the responsibility of the Miller household.

In July, we attached barn siding, consisting of random-width shed-dried oak boards obtained from logs sawn on Shepherd's Knoll. The sounds of our radial arm saw and whine of electric drills filled the air when the Millers got busy. An important aspect of our barn building project is that Dad and Mom work with daughters Katerina (age 13) and Zoya (age 11). Family participation creates enthusiasm. Our daughters are motivated to work as they dream of the horses we will stable and future opportunities to canter those horses over the meadows and through the woods of Shepherd's Knoll.

During less busy times, I reflect on the creativity, energy, and errors involved in our barn-building project. For example, in meeting with the plumber, we made decisions about the location of water lines that differed from the original plan. Earlier, due to a miscommunication, the construction company ordered and installed the wrong metal roof color. While the color we originally selected matched our house and other

outbuilding roofs, the color of the new barn roof differed and clashed. Mistakes are costly; who pays for them? More importantly, what is the best way to rectify such a blunder? Creativity and resourcefulness are required both in planning details and in correcting errors.

The writer of Hebrews puts *building* in perspective by describing in principle the origin of the building impulse: "For every house is built by someone, but God is the builder of everything" (Hebrews 3:4, NIV). Is not the urge and ability to build part of our creative nature, endowed to us by the great Builder and Designer? Did God in creation translate idea to drawing, to material acquisition, to construction, and finally to residence?

We plan, build, and hope that our constructions will endure for a time, maybe even beyond our life span! In designing a retaining wall, I was encouraged by our agricultural builder who said, "Make this a good wall, one that will last and not be a repair problem for your children." However, reality reminds us that building barns, ideologies, or fortunes are all subject to decay and destruction. Jesus extols us: "... store up for yourselves treasures in heaven, where moth and rust do not destroy, and where thieves do not break in and steal" (Matthew 6:20). At the end of the day, have I invested in heavenly treasures that endure? Does the urge to build a horse barn take too much of our priorities and make the heavenly "nest-egg" paltry by default? I trust that is not the case. Can we not both build a horse barn and family relationships for the Kingdom of Christ? As we simultaneously build both for time and eternity, we will experience blessing and reward for work well done!

A Barn & Kingdom Builder,
Roman J. Miller, *Editor*

In this Issue

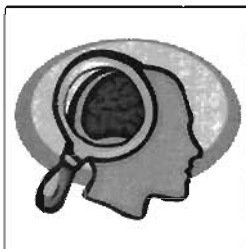
Again due to the sixteen extra pages supported by the contribution of a generous donor, this issue of *PSCF* contains eight interesting and informative articles, rather than the typical three or four found in many issues.

The first triplet of papers by Malcolm Jeeves, David Siemens, and Peter Rüst relates to the neurobiology theme of the 2004 Annual Meeting of the ASA. These three papers explore various aspects of the nature of humanness and the image of God.

The next two papers by D. Gareth Jones and Hessel Bouma describe issues of health care ethics as they impact our society.

Finally, the last triplet of papers portrays a variety of faith and science issues: Jerry Bergman reflects on the reasons for the extinction of the dodo bird; Randy Isaac takes up the theological issue of gaps in our understanding; and Giuseppe Tanzella-Nitti explores historical perspectives on the revelation of God through science and Scripture.

As normal, we follow our articles with a selection of book reviews and conclude our issue with one letter.



Article

Neuroscience, Evolutionary Psychology, and the Image of God

Neuroscience, Evolutionary Psychology, and the Image of God

Malcolm Jeeves



Malcolm Jeeves

In
what sense
are we made
in the
image of God?

Almost daily we read media reports of scientific breakthroughs, often in neuroscience and evolutionary psychology, which, it is claimed, offer new insights into our mysterious human nature. Most of these reports present no direct challenge to widely held traditional Hebrew-Christian understandings of human nature. Others, however, seem directly to confront some of our most deeply held Christian beliefs about our nature. Beliefs reinforced as we sing some of our favorite hymns.

Whilst references to the "image of God" are relatively infrequent in Scripture nevertheless the understandings of humankind which they enshrine are all pervasive. For two millennia, Christian Councils and Confessional Statements have presented different, competing views of what is of the essence of being made in "the image of God."

Acknowledging the persuasive current impact of neuroscience and neuro-philosophy this paper urges us to remember that biblical warrant and scientific evidence join in reminding us that central to our understanding of what it means to be a person is our psychosomatic unity. We know each other, not as brains ensheathed in bodies, but as embodied persons. We are people who relate to each other as beings created in the image of God. This image is not a separate thing. It is not the possession of an immaterial soul. It is not the capacity to reason. It is not the capacity for moral behavior. It is not the possession of a "God spot" in our brains. It is acknowledging "our human vocation, given and enabled by God, to relate to God as God's partner in covenant. To join in companionship of the human family and in relation to the whole cosmos in ways that reflect the covenant love of God. This is realized and modeled supremely in Jesus Christ."¹

A proper understanding of the doctrine of the image of God is an essential groundwork to formulating and understanding a proper Christian response to humanitarian, evangelistic, apologetic, and ecological concerns.

Malcolm Jeeves is a past president of the Royal Society of Edinburgh, Scotland's National Academy of Science and Letters, and a Fellow of the Academy of Medical Sciences and of the British Psychological Society. A graduate of Cambridge (B.A., M.A., Ph.D.) in natural sciences, he has received honorary degrees from Edinburgh, St. Andrews, and Stirling Universities. He is emeritus professor of psychology at St. Andrews University and was formerly editor-in-chief of the international journal *Neuropsychologia* and a past chairman of the International Neuropsychological Symposium. In 1992 he was honored by the Queen, being made a Commander of the Order of the British Empire for his services to science and psychology in Britain. A neuropsychologist, his major research interest for more than three decades was neural plasticity as evidenced by the behavioral and cognitive functioning of a very small group of patients born without the corpus callosum, the major commissures connecting the two cerebral hemispheres. Throughout his career he has been actively involved in Christian witness amongst students. He was national president of Australian Intersarsity in 1969 and of British Intersarsity in 1976.

This paper is about our current understanding of human nature. More specifically, in the Christian context, it is about answering the question, "In what sense are we made in the image of God?" Nearly two millennia ago, St. Augustine asked the question: "What then am I my God? What is my nature?"² and the same question has become increasingly pressing today as it has moved rapidly from the almost exclusive domain of philosophers and theologians to something approaching center stage in scientific discussions, primarily those of neuroscientists and evolutionary psychologists.

In both fields, there have been exceptionally rapid developments in recent decades. For example, at a 2004 Society for Neuroscience conference there were 27,000 participants. At its inaugural meeting in 1969, there were fewer than one hundred participants. Such has been the exponential growth in the amount of effort and funding devoted to brain research.

Within both the scientific and religious communities, some have speculated about how traditional ways of thinking about human nature may need to change as we digest the impact of discoveries in neuropsychology and evolutionary psychology.

The Nobel laureate David Hubel fifty years ago arguably initiated the fresh impetus of research in neuroscience with his discoveries with Torsten Wiesel of brain cells that selectively responded to bars of light depending on their orientation. He wrote, in 1979, that "fundamental changes in our view of the human brain cannot but have profound effects on our view of ourselves and the world."³ With the explosive rise in the number of neuroscience researchers, our view of the human brain has changed dramatically in the past two decades. How has this affected our views of ourselves?

It is not only neuroscience that impacts our traditional views of our own nature. Evolutionary psychology is witnessing a similar rapid expansion. The potential of evolutionary psychology has so impressed some of its practitioners that David Buss, for one, sees it as providing the new overarching framework for the whole of psychology.⁴ Not everyone agrees. But there is no doubt that the scene is set for exciting developments in research at the interface of psychology and evolutionary biology.

Developments in brain imaging techniques also have contributed immensely to research at the interface of neuroscience and psychology. These, in turn, have impacted developments in evolutionary psychology, leading to attempts to formulate a so-called "theory of mind" and to identify the mind's possible neural substrates.

Within both the scientific and religious communities, some have speculated about how traditional ways of

thinking about human nature may need to change as we digest the impact of discoveries in neuropsychology and evolutionary psychology. From the scientific side, another Nobel laureate, Francis Crick, the co-discoverer of the structure of DNA, and who spent much of the latter part of his career studying the neuroscience literature, had no doubt that neuroscience would have a profound impact on our religious beliefs about our nature. He wrote in 1994: "The idea that man has a disembodied soul is as unnecessary as the old idea that there was a Life Force. This is in head-on contradiction to the religious beliefs of billions of human beings alive today." Crick further posed the question: "How will such a radical change be received?"⁵ Shortly before he died in 2004, he made the further assertion: "In the fullness of time, educated people will believe there is no soul independent of the body, and hence no life after death."⁶

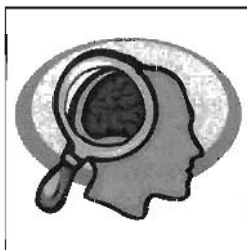
The main focus of Crick's questioning of religious beliefs was that it had become increasingly difficult to hold a dualistic view of the person viewed as made up of two separate substances, soul and body (or mind and brain). Interestingly, for almost a century, some Old Testament scholars have been querying the supposed biblical foundations for dualist models. Commenting on the tenacity with which many Christians wish to hold on to dualistic views, Lawson Stone wrote:

If the immortality of the soul, and hence, dualism are essential to Christian thought, then the Church should be bracing for an encounter with science far overshadowing debates about creation and evolution."⁷

Stone himself claims that the Bible does not support belief in dualism. A similar view was spelled out by several of the contributors to the 1988 book *Whatever Happened to the Soul?*⁸

In light of these comments, it behooves us to pause, examine the evidence—both scientific and biblical—and seek to arrive at a view which does justice both to the biblical evidence and to the scientific findings. As Christians, we have the further task of ensuring that whatever we say takes with full seriousness the timely reminder of another biblical scholar, Patrick Miller. Writing about the anthropology of Scripture, he emphasizes that true humanity above all is seen in the face of Jesus. Thus he wrote: "There is an important christological understanding of the answer to the question 'What is a human being?'" Noting further that "there is an incarnational answer to the anthropological question" he underlines that "whatever we say about the human reality must take into account the face of Jesus Christ."⁹

This is underlined again when New Testament scholar Joel Green writes: "Humanness ... is realized in and modeled by Jesus Christ."¹⁰ We shall return to this crucially important theme in closing.



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Human Nature and the Image of God

Francis Crick's focus on the possession of an immaterial and immortal soul as defining human uniqueness from all other creatures and as constituting what it means to be made "in the image of God" is perfectly understandable given the centrality of the idea down two millennia of church history. It also resonates with the wide acceptance today by religious people, New Agers, and humanists who hold varieties of dualistic views. However, we should perhaps pause and remember that as a candidate for what constitutes the "*imago dei*," it is only one of a list championed in the past and still defended today in church catechisms and statements of core beliefs.

The dangers and pitfalls of any superficial treatment of what is meant by the image of God (especially when it is given by a scientist!) is highlighted by reference to larger scholarly works such as Westerman's commentary on Genesis 1-11¹¹ and von Rad's earlier 1956 commentary on Genesis.¹² Both agree that a key starting point for securing a biblical understanding of the *imago dei* is the passage in the opening chapter of Genesis where we read:

Then God said let us make man in our image, after our likeness. And let them have dominion over the fish of the sea and over the birds of the heavens and over the livestock and over all the earth and over every creeping thing that creeps on the earth.

So God made man in his own image, in the image of God he created him; male and female he created them (Gen. 1:26-7).

Westerman concludes his survey of studies of these verses by saying that they will reveal a common trait: "All exegetes from the fathers of the church to the present begin with the presupposition that the text is saying something about people, namely that people bear God's image because they have been created in accordance with it." And he goes on: "The whole question therefore centers around the image of God in the person: what is intended, in what does it consist, what does it mean?" However, Westerman himself believes that "*there can be no question that the text is describing an action, and not the nature of human beings*" (my italics).¹³

He writes: "Most interpretations presume without more ado that the verb 'create' can be understood in itself and apart from the context in which it is set. *But the text is speaking about an action of God, and not about the nature of humanity*" (my italics). He adds: "A false start has been made here which could have been avoided" and he concludes: "What the Old Testament says about the creation of humanity in the image of God has meaning only in its context, namely that of the process of the creation of human beings."¹⁴

This leads him later to make the related comment that God has created all people "to correspond to him" so that something can happen between creator and creature.

Seen from another point of view, the sentence means that the uniqueness of human beings consists in their being God's counterparts. *The relationship to God is not something which is added to human existence; humans are created in such a way that their very existence is intended to be their relationship to God* (my italics).¹⁵

Note here that his conclusions underline and emphasize repeatedly that it is the *capacity for relationships* which is the key to the proper understanding of the *imago dei*. We shall return to this later.

Another biblical scholar, Joel Green, has reminded us that reference to the key passages in the opening chapters of Genesis quickly became the basis for a view of the *imago dei* focusing on the (unique) possession of a soul.¹⁶ However, Green urges us to re-examine a commonly held interpretation of Gen. 2:7 where we read: "And the Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life and man became a living soul." Green has pointed out that this passage has been read as implying that humans were made in the image of God by being given an immortal soul in contradistinction to the animals. He tells us, however, that this proof text is now better understood if we read it as a further comment on what has already been written in Gen. 1:1-27. The word translated "soul" in Gen. 2:7 is a word that has already appeared in Gen. 1:20, 21, 24, and 30 where in every case it refers to animals, thus underlining that humans and animals are souls. They are "living beings" as distinct from inanimate objects that have no life.

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With these preliminary guidelines in mind, we turn now to examine the meanings of the *imago dei* which have received the most enduring attention in the history of theology and which are still affirmed in various Christian traditions today. In each instance, we shall ask whether they are making claims which are open to current scientific evidence and, if they are, what is their status in light of that evidence.

Neuroscience and the Challenge to Dualism

The accumulating evidence from research in neuroscience, like all scientific evidence, has to be critically evaluated and interpreted. There are certainly no knockdown arguments that prove conclusively that mind-brain dualism is wrong and that a more nuanced view of mind-brain interdependence is right. Neuroscience Nobel laureates can be lined up on both sides of the argument for or against dualism. Sir John Eccles presented a neurobiological basis for dualism.¹⁷ Roger Sperry argued against dualism though even he at times leaned toward some form of interactionism.¹⁸ Francis Crick, as we have seen, had no doubt that dualism was, in the light of accumulating scientific evidence, untenable.

The nonspecialist may get the flavor of what neuroscience has revealed about mind-brain links and where it is heading by noting the following key signposts along the way.¹⁹

1. The possibility that what happens in the mind depends upon what happens in the brain goes back for at least two millennia. Physician and anatomist Galen tending the gladiators in the Roman arena had observed that injuries to the brain at times resulted in changes in personality and mental life. Galen's views however were forgotten for many centuries. By the eighteenth and nineteenth centuries, there was a resurgence of attempts to localize particular mental processes to particular areas of the brain. The early phrenologists, for example, Gall and Spurzheim, were not cranks but some of the leading anatomists of their day. Their views gave respectability to the possibility that specific mental abilities might be localized in particular regions of the brain. These claims were reinforced by the reports of the early work of people like Bouillard, a French physician, in 1825; Marc Dax, a neurologist, in 1835; and Paul Broca who in 1861 gave the first clues to speech being located in the left cerebral hemisphere. In the space of less than one hundred years, the possibility that brain events and mind events were systematically related gave way to an increasing recognition of clear links between, for example, brain and language and intellectual functions generally.

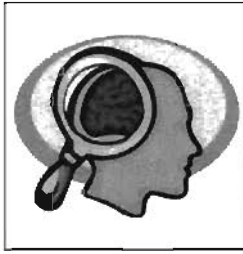
2. There were still, however, strong views by distinguished physicians on the other side of the argument. For example, early nineteenth-century physician Pierre

Flourens, a pioneer in techniques making small lesions in the brains of animals, produced results that could be interpreted as showing that psychological functions are not discreetly localized in particular cerebral areas. This view was championed in modified form a century later by Harvard neuropsychologist Karl Lashley, who put forward his theory of mass action.²⁰ Lashley's own work convinced him that although sensory and motor functions are in some sense localized that did not establish clear-cut, functional localization. His experimental findings, he believed, pointed to the association cortex as substantially equipotential. When studying the effects of lesions on the impairment of learning and memory, he believed that any impairments depended on the extent rather than the locus of the incision. This relationship became known as the law of mass action. Today, as we shall see in a moment, the localizationist view is dominant and well documented, though at times it is presented in the media in such a way that it verges on looking like an updated version of an outmoded form of phrenology. The upshot of many years of careful research points to the conclusion that neural and mental processes are best seen as two aspects of one unified whole.

Many years of careful research point to the conclusion that neural and mental processes are best seen as two aspects of one unified whole.

3. There was a phase in the history of psychology, noteworthy around the middle of the last century, which is puzzling to many nonpsychologists in that for several decades psychologists seemed inhibited about talking about the mind. Distinguished behaviorist B. F. Skinner so dominated the North American scene with his views that those who dared to speak of mind were, at times, labeled as unscientific. Fortunately there was a strong reaction against this which gave rise to the so-called cognitive revolution following which once again psychologists were allowed to speak about mind, and hence about mind and brain relations.

4. Most historians of the period agree that the possibility of a major step forward in the understanding of the relations of mind and brain was made possible primarily by the confluence of three hitherto largely separate research programs. First, there were developments in experimental psychology made possible by a fractionation of memory



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A major step forward in the understanding of the relations of mind and brain was made possible primarily by ... developments in experimental psychology ... the onset of the cognitive revolution ... [and] new brain imaging techniques ...

into its component parts so that each could be studied separately. Second, the onset of the cognitive revolution made it possible once again to be a respectable scientist and to study mind. Thirdly, and perhaps most importantly, new brain imaging techniques revealed how doing specific mental tasks selectively mobilized particular brain regions.

5. Before the rapid advances in brain imaging techniques, the most effective way of studying mind-brain relationships or behavior-brain relationships was an approach often labeled as a "bottom-up" approach. This referred to the fact that the experimental procedure was to make changes in selective neurological and/or biochemical substrates of the brain and then to observe how behavior or cognitive capacities were changed as a result of these neural manipulations. It was not even necessary to produce surgical lesions, since, following on the pioneering work of Hubel and Wiesel referred to earlier, there was a rapid expansion in methods which depended upon implanting very small electrodes in columns of cells in the brain. Researchers then monitored the activity in those cells, as the subjects, usually animals, were presented with a variety of sensory stimuli.

Here is a research example. Twenty years ago, David Perrett and his colleagues at St. Andrews used single cell recording techniques to map regions in monkeys' brains that responded selectively to the sight of human faces.²¹ Every new study seemed to tighten the links between what the monkey was seeing and how the cells of the brain were responding. There was a remarkable specificity in the cells' responses to facial stimuli. Among other things, Perrett found, for example, that changing the view of a face in its horizontal orientation from side profile to full face and back had a dramatic effect on the level of activity of face responsive neurons. All this suggested to Perrett that one of the key functions of these neurons may be to determine the direction of another's gaze. He proposed that the information provided by the eyes, the face, and the body was selectively processed by different columns of neurons, all part of a processing hierarchy for attention direction or social attention. Other researchers demonstrated this was a part of a larger system.²²

6. Links between brain and mind are not confined to perception and cognition but also to the understanding of differences in human personality and behavior. This also has a long and checkered history, and most who tell the story start with the account of how railroad foreman Phineas Gage, while working on the New England railroad, accidentally suffered damage to the frontal part of his brain and thereafter was a changed person.²³

A dramatic example of a similar change was reported very recently describing how a schoolteacher had begun collecting sex magazines, visiting pornographic web sites, and focusing his attention on images of children and adolescents. This was something which, according to him, he simply could not stop himself doing. He was arrested for child molestation, convicted, and underwent a rehabilitation program which was unsuccessful. The day before his final sentencing he went voluntarily to the hospital emergency department complaining of a severe headache. He was distraught and contemplating suicide and was aware that he could not control his impulses so much so that he propositioned the nurses in the hospital. An MRI scan of his brain revealed a large tumor pressing on his right frontal lobe. The surgeons removed it and the lewd behavior and pedophilia faded away. Sadly, after one year he began to manifest pedophilia afresh. New MRI scans showed that the tumor was beginning to regrow. It was removed and once again his urges subsided.²⁴ This case, not surprisingly, received wide publicity and comment. One thing, however, is clear. It demonstrated the remarkably tight links between what is happening in the brain and the manifested behavior.

7. So far we have concentrated on "bottom-up" effects. More recently with the use of more sophisticated brain imaging techniques there has been a rapid increase in research reports pointing to the importance of what are sometimes called "top-down" effects, referring to cognition producing localized changes in the brain.

Let us consider two examples. First, Maguire and his colleagues noted that licensed London taxi drivers are renowned

for their extensive and detailed navigation experience and skills. When studying structural MRI's of the brains of a group of taxi drivers and of matched controls, they discovered that, as a result of two years of intensive training in navigation, the anterior hippocampi of the taxi drivers were significantly larger. Moreover, the volume of grey matter in the right hippocampus correlated significantly with the amount of time spent as a taxi driver. The researchers concluded: "It seems that there is a capacity for local plastic changes in the structure of the healthy adult human brain in response to environmental demands."²⁵

The picture emerging ... points to the intimate relationships among mind, brain, and behavior.

The second example is a study by O'Craven and Kanwisher that beautifully illustrates how the mind can selectively mobilize specific brain systems. They asked volunteers to look at pictures of faces or houses or to imagine these pictures. They demonstrated how imagining faces or houses selectively activated the same areas of the brain as when the subjects were seeing the pictures of faces or houses. Specifically, seeing or thinking about faces activated the fusiform face area, while seeing or thinking about houses activated the parahippocampal place area. The experimenters showed that they could actually "read the minds" of their subjects by observing their brain activity. They could tell whether the subjects were thinking about faces or houses by measuring activity in respective brain areas.²⁶

The picture emerging from the science briefly reviewed points to the intimate relationships among mind, brain, and behavior. We described some of these as "bottom-up" and some as "top-down." There is now an emerging consensus about how to portray these intimate relationships. For example, neurologist Antonio Damasio wrote:

The distinction between diseases of brain and mind and between neurological problems and psychological/psychiatric ones, is an unfortunate cultural inheritance that permeates society and medicine. It reflects a basic ignorance of the relation between brain and mind.²⁷

Robert Kendell, a recent Past President of the Royal College of Psychiatrists in Britain, wrote:

Not only is the distinction between mental and physical ill founded and incompatible with contemporary understanding of disease, it is also damaging for the long-term interests of patients themselves.²⁸

Modeling "Soul-Body" and "Mind-Brain" Relationships

It is one thing to observe this consistent pattern of the intimate links between mind and brain but it remains an enduring problem to know how most appropriately to conceptualize it. Some talk about a relationship of *identity*, some of *interaction*, some of *interdependence*. Interdependence has the virtue of not going beyond the available evidence. Given this interdependence how can we take proper account of the primacy of self-conscious human agency in modeling the relationship of mind and matter? We may project this concept of human agency on to the outside world in terms of an image of brain events, or we may take the standpoint of the agent herself experiencing mental events. Many have suggested that these two are best seen as complementary descriptions and it is a distortion of reality to say that they are "nothing but" the one or "nothing but" the other. There is an intrinsic duality about the reality we have to deal with but this does not need to be seen as dualism of substances. We may regard mental activity and correlated brain activity as inner and outer aspects of one complex set of events that together constitute conscious human agency. Two accounts can be written about such a complex set of events, the mental story and the brain story, and these demonstrate logical complementarity. In this way, the irreducible duality of human nature is given full weight, but it is a duality of aspect rather than a duality of substance.

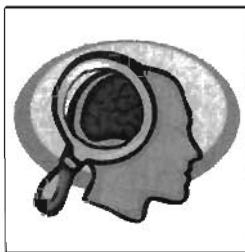
Scientists writing about issues that have occupied the minds of great philosophers from the past is fraught with hazards. With the permission of Professor Nancy Cartwright, I have read philosopher Sir Stuart Hampshire's shortly to be published monograph, *Spinoza and Spinozism*, which is full of insights on mind-brain relations.²⁹ The following quotations from Hampshire's posthumous monograph resonate strongly with some of the analyses offered above.

On the "naturalness" of dualism, he has written:

It must be admitted that Descartes' metaphysics does correspond fairly closely, although not exactly, with the intuitions about mind-body relations that are incorporated in our ordinary day-to-day language. We do indeed think of the mind as its own place and we do indeed think of thoughts of all kinds, of their causes and effects, as constituting an order which is irreducibly distinct from the order of physical objects in space.

Of our psychophysical unity, he writes:

The intimately linked psychophysical nature of the activity of perceiving is gradually investigated by empirical psychologists, and the philosophical myth of perception as the implanting of ideas in the mind is now dismissed. *We are ready to accept the double aspect theory of reality ... (my italics).*



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Later on this same theme, he writes:

In finding a way round Descartes' hopeless division of reality into two quasi-substances, thought and extension, hopeless because of the problems of linkage and intersection, the evident escape was to categorize Thought and Extension as universal attributes of reality, rather than as divisions in reality. Activities and actions are attributed to things in nature, and all activities have two aspects: first, the sense or meaning or purpose that animate them as activities or actions; secondly the aspect of physical bodily movement or change that is involved in the activity or action.

Hampshire also endorses Spinoza's critique of some models of mind and brain. It is salutary to remember that Spinoza's views long predated any detailed scientific knowledge of how the brain works. For example, Hampshire writes:

This is part of Spinoza's meaning when he writes that the mind must not be thought to be lodged in the body like a pilot in his ship. The connection between the two aspects of personality – between the person reflecting on his physical activities and states and the person pursuing these activities is as close as any connection can be.

Though not setting out directly to address the issue of the Christian view of the soul, it is interesting that Hampshire has written:

It no longer seems so important to distinguish exactly and consistently between the powers of a person as embodied in his brain and the powers of a person as a thinking being. It becomes important, if one is concerned with the mind as being the immortal soul required by many Christian churches, or with some part of the mind being identified with the immortal soul, to be liberated at death from the perishing body.

Finally, a telling quote about the complementarity of the two aspects of reality that he has repeatedly emphasized. He writes:

When you think of the relation of ideas to *ideatum*, of thought to body and brain, you interpret it as parallel to the relation of music to score. You can

either start with the music and expect the score, or start with the score and expect the music. So with the relation of thought to body and brain. Neither is more fundamental than the other. Yet there is a tendency to think of the body and brain as the substrate, or ground, upon which thought is based. This cannot be right, because the two attributes are complementary and completely equal and co-extensive within the one substance, and neither of them can be reduced to the other or causally related to the other.

In other words, reductionism will not do, and neither will substance dualism.

In his recent essay, Harvard physiologist and sleep researcher J. Allan Hobson speculates about how the distinguished Nobel laureate physiologist Sir John Eccles managed to continue to maintain his dualist view regarding the mind-brain relationships analogous to that of the pianist playing a piano, similar to the view of the pilot and the ship criticized by Spinoza so long ago. Hobson believes that, on the one hand, Eccles had not come to terms with the accumulating evidence from sleep research, which showed that "it was clear that the mind was not separated from the body in sleep, as Eccles had claimed ten years earlier."³⁰ Hobson claims that "all available evidence is that consciousness, including what we might call spirit or soul is a brain function."³¹ He concedes, however, that "presumably, diehard dualists, like Eccles, could still retreat to the position of Rene Descartes, insisting that the relationship of mind and brain we observe in every instance is best understood as two perfectly synchronized watches, set in parallel motion by God and evidencing God's remarkable creative process."³² Hobson adds: "The problem is that no evidence whatsoever exists to favor this hypothesis over the integrationist view that mind and brain are two levels of a uniform system."³³ And, we might add, in the light of the comments of the biblical scholars cited above, there is little or no biblical warrant for postulating a soul-body or mind-brain dualism.

Another area of neuroscience upon which Eccles leaned heavily in his defense of dualism was the widely publicized work of neurophysiologist Libet. Libet's work first

appeared more than twenty years ago. Today assessments of how best to understand and interpret Libet's findings lend little support to Eccles' views. Gomes recently reviewed Libet's findings and concluded that efforts by authors like Trevena and Miller to rescue a dualist interactionist explanation were unsuccessful.³⁴

The Persistence of Pervasive Dualism in Philosophical and Theological Circles

The notion that humans possessed a soul was typical of the thinking of major figures from the past such as Plato, Aristotle, Origen, Nemesius, Augustine (who held a modified Platonic view), and Descartes. Until relatively recently in the Western world, the dominant cultural influences have been the religious ones. However, such views were not universal. In the late Middle Ages, St. Thomas Aquinas made an impressive synthesis of Christian and Aristotelian ideas which has since become Catholic orthodoxy. Stevenson writes that Aristotle (and those who followed him) believed that "the human soul or mind should be understood not as a thing, but as a way of functioning, or, more precisely, a distinctive cluster of faculties including reasoning, which are fundamental to the human way of living and functioning."³⁵ Stevenson reminds us how Aristotle wrote: "It is surely better not to say that the soul pities, learns, or thinks, but that the man does these with his soul" (*de Anima* 408b15). Thought of in this way, it does not make sense to talk of a soul or mind existing without a body for, says Stevenson: "If there is nobody (or at any rate no living body), then there can be no way that the body is functioning, for it is not functioning at all."³⁶

However, as Stevenson further points out, Aristotle curiously suggests that "there is something especially different about the human intellect, namely our faculty for purely theoretical thought." This faculty, this kind of functioning, can exist separately from the body "as the everlasting can from the perishable" (*de Anima* 413b26). Stevenson continues: "Some of Aristotle's Islamic and Christian successors were happy to exploit this apparent backtracking in his philosophy of mind." Under Aristotle's influence, "Aquinas thus retained an element of Platonism arguing that the soul has a separate existence until the resurrection, and that this helps to solve the problem of maintaining personal identity but at the cost of incurring all the problems associated with dualism."³⁷

Similar strongly dualistic views are found in the writings of some of the Protestant reformers such as John Calvin who writes:

It would be foolish to seek a definition of "soul" from the philosophers. Of them hardly one, except Plato, has rightly affirmed its immortal substance ... Indeed, from Scripture, we have already taught that the soul is an incorporeal substance ...³⁸

In the light of the science that we have briefly reviewed, what are we to make of these widespread dualist views so pervasive in the Christian church? "The theologians of the early church began to use ideas from Greek philosophy," noted Leslie Stevenson, "and the concept of immaterial and immortal soul found its way into Christian thinking and has tended to stay there ever since."³⁹

There is an intrinsic duality about the reality we have to deal with but that does not need to be seen as dualism of substances. It is, in short, wiser to return to the biblical view, the holistic view of the human person.

The views of both Catholic and Protestant divines are kept alive today by scholars such as John Cooper, who writes:

Against the objection that Scripture is monistic, our study has demonstrated that the biblical view of human nature is both holistic ... and dualistic — asserting that persons are held in existence without fleshly bodies until the resurrection ... The monisms are incapable of allowing for this intermediate state.⁴⁰

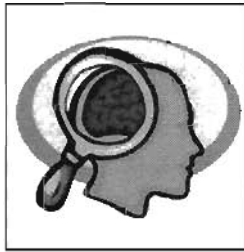
Such views have, however, to be put alongside those of other biblical scholars. Joel Green writes:

From a neuroscientific perspective, it is now unnecessary to postulate a second, metaphysical entity, such as the soul or spirit, to account for human capacities and distinctives.

The dominant view of the human person in the New Testament is that of ontological monism, such notions as "escape from the body" or "disembodied soul" falling outside the parameters of New Testament thought.⁴¹

More recently, and directly addressing Cooper's appeal to the soul as being necessary for an intermediate state, Green writes:

Among persons holding to some form of anthropological dualism, a crucial piece of evidence has been the presumption of the centrality to biblical eschatology of the disembodied intermediate state. I demonstrate the fallacy of this presumption and suggest that an eschatology, in which a disembodied, inter-



Evidence for reasoning and thinking abilities in nonhuman primates is available. While rudimentary, today they are seen to overlap with similar abilities in developing small children. It therefore becomes increasingly difficult to seek to anchor a belief in the uniqueness of humans created in the image of God in terms of reasoning.

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mediate state plays the central role, is poorly supported by the biblical evidence.⁴²

All of the evidence that we have looked at can be seen as indicating that it is a distortion of the reality that we study to say that the account given in mental categories, and the account given in neural categories, are competitors, rather than they should be seen as complementary descriptions. It is wrong to say that "nothing but" the one or "nothing but" the other will suffice. There is an intrinsic duality about the reality we have to deal with but that does not need to be seen as dualism of substances. It is, in short, wiser to return to the biblical view, the holistic view of the human person.

The Imago Dei as the Capacity to Reason

The following is an extract from a catechism of the Catholic Church:

God ... can be known ... by the natural light of reason ... Man has this capacity because he is created "in the image of God."⁴³

This Catholic view is firmly embedded in the works of Descartes, who wrote:

The human mind, by virtue of its rationality, provides evidence both of a kind of image of God and at the same time a criterion of radical discontinuity from the rest of creation. The animals are merely machines, and it is said that some of the enlightened believe that their cries of pain are no more than the squeaks of unlubricated machinery.⁴⁴

How do such views stand in the light of research into the cognitive capacities of animals and more especially of nonhuman primates? We mentioned earlier the rapid development of evolutionary psychology, and there is now a large body of evidence pointing to the conclusion that animals also think. There is, for example, an expanding research literature discussing whether or not chimpanzees have a "theory of mind." For example, read the two volumes on so-called Machiavellian Intelligence.⁴⁵ Further evidence of behavior which, if it were seen in humans, would be described as imagination and as involving inventiveness and means-end reasoning is now available.⁴⁶ Studies at

the interface with neuroscience indicate how these emerging capacities may be related to the development of the brain.⁴⁷ In each instance, any attempt to set down a clear demarcation between the reasoning abilities of nonhuman primates and humans is found to have become blurred.

This, of course, is not to deny that there are distinctive capacities in humans which have led to the explosive development of learning, philosophy, literature, music, art, science, and so on. No one is claiming that. The point is simply that evidence for reasoning and thinking abilities in nonhuman primates is available. While rudimentary, today they are seen to overlap with similar abilities in developing small children. It therefore becomes increasingly difficult to seek to anchor a belief in the uniqueness of humans created in the image of God in terms of reasoning.

More than three centuries later, we today can find reassuring comments from Christian thinkers and leaders in the past. Blaise Pascal, for example, wrote:

It is dangerous to show a man too clearly how much he resembles the beast, without at the same time showing him his greatness, it is also dangerous to allow him too clear a vision of his greatness without his baseness. It is even more dangerous to leave him in ignorance of both.⁴⁸

The Imago Dei as the Capacity for Moral Behavior and Moral Agency

The illustrious North American theologian Jonathan Edwards wrote: "... herein does very much consist that image of God wherein he made man ... viz in those faculties and principles of nature whereby he is capable of moral agency" (my italics).⁴⁹ If Edwards was claiming that this capacity was unique to humans, then we may ask, "How does such a claim stand today in light of developments in evolutionary psychology?"

Over the past three decades, evidence has been steadily accumulating of behavior which, if we were to witness it in humans, we would attribute to the possession of a moral sense and moral agency. Thus, for example, Frans de Waal has written: "Aiding others at

the cost or risk to oneself is widespread in the animal kingdom.⁵⁰ He adds: "The fact that the human moral sense goes so far back in evolutionary history that other species show signs of it plants morality firmly near the center of our much maligned nature."⁵¹ Clearly self-giving is found not just in God's human work.

Some fear that another claim to human uniqueness is gone. But just because two behaviors are superficially similar is no reason to assume that the underlying mechanisms and thinking patterns are identical. Self-giving, self-sacrificing behavior appears in different animals. But that in itself tells us nothing about what underlies those behaviors. Self-giving behavior, for example, may occur with or without self-awareness.

Is there any evidence in Scripture to support the view that the image of God in humans is to be defined in terms of a unique capacity for moral behavior and moral agency? If there is, we await its identification.

It seems that there are good arguments for believing that some aspects of self-giving and self-limiting behavior have developed over our evolutionary history and become more pronounced among nonhuman primates. For those of us who begin from theistic presuppositions, it means we can see embedded within creation the seeds, development, and fruits of self-giving behavior. We do not need to deny the emergence of self-giving altruism in primates in order to defend the unique self-emptying sacrifice of Christ. That, we believe, was a unique and ultimate act that sets Christ apart from all others in heaven and on earth.

De Waal and other leaders in the field are at pains to point out the dangers of sloppy thinking in this area. For example, de Waal writes:

Even if animals other than ourselves act in ways tantamount to moral behavior, their behavior does not necessarily rest on deliberations of the kind we engage in. It is hard to believe that animals weigh their own interests against the rights of others, that they develop a vision of the greater good of society, or that they feel lifelong guilt about something they should not have done.⁵²

In order to defend the uniqueness of the developed human capacities for moral agency, it is not necessary to deny evidence of their emergence in animals and, in particular, in nonhuman primates. However, the more important question for Christians is, "Is there any evidence in Scripture to support the view that the image of God in humans is to be defined in terms of a unique capacity for moral behavior and moral agency?" If there is, we await its identification.

The *Imago Dei* as a Unique Capacity to Apprehend the Transcendent and the Numinous

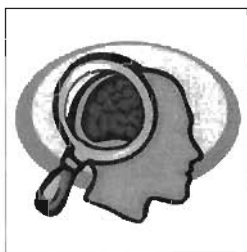
At times the image of God in humans has been linked to evidence for our capacity for appreciating and interacting with the transcendent and the numinous. For example, one volume of *Systematic Christian Dogmatics*, published a century ago, contained this assertion:

The image of God in man is thus nothing but his destiny to become a child of God in the kingdom of God, or the capacity necessary for the realization of this destiny. This reflects the move beyond the traditional faculties (cognitive, conative) to the capacity for the religious, the numinous, for which Otto is, of course, famous (my italics).⁵³

Related to any claim that the *imago dei* is to be seen in the possession of an inbuilt capacity to be in touch with the transcendent, there are today strong claims being made that just such evidence comes from the expanding field of neurotheology. The past two decades have seen a dramatic resurgence of interest in understanding the human capacity for appreciating the transcendent, the religious, and the numinous.

Hobson, in the article on Eccles mentioned above, reminds us how the seventeenth-century natural scientist, philosopher, and mystic, Emanuel Swedenborg, learned to intensify his dreams by sleep deprivation. Hobson wrote:

The natural result of sleep deprivation is called a "REM rebound." After losing REM sleep, we normally pay back the debt by longer, and stronger, REM periods. Dreaming duration and intensity then increase. In due course, Swedenborg experienced one of these rebounds, in which he said he met God's angels in person and received from them instructions for the founding of the Church of the New Jerusalem. Interpreted through the lens of modern neuroscience, the Swedenborg story confirms that no *vis externa* is necessary to account for this apparently miraculous revelation. It is sufficient to tilt the brain's own REM sleep system in the direction of hallucinatory overdrive in which people can meet whomever they want and accomplish whatever bit of carnal or spiritual business appeals to them.⁵⁴



Using the latest brain imaging techniques, attempts have been made to identify the part or parts of our brains most active when we are meditating, praying, or seeking to be in touch with the transcendent. ... [B]y locating the "God spot" in the brain, it [does not] support the claim that this is the true meaning of the image of God in humans. There is no biblical warrant for such a view.

Article

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Using the latest brain imaging techniques, attempts have been made to identify the part or parts of our brains most active when we are meditating, praying, or seeking to be in touch with the transcendent. Some dramatic results have been published and have gained wide media exposure. However, it needs to be remembered that such attempts to link differentially certain parts of the brain to the transcendent has a long history. In much of the early work, interest was focused on what appeared to be an above-average manifestation of visions in those who were suffering from some forms of epilepsy. This in turn led to the idea that it was in these parts of the brain, the temporal lobes, that the capacity for being in touch with the transcendent is localized. Work in this area has been the focus of researchers such as Persinger.⁵⁵ Although in his early writings, he wrote as if to identify a brain area that was active was to "explain away" the phenomenon, it would appear that in his more recent statements, he is anxious to distance himself from such a view and to point out that his interest is strictly scientific and not taking sides in the science and religion debates.

In one of the earliest volumes on this topic which had the provocative title *Where God Lives in the Human Brain*, Carol Albright and James Ashbrook believed that they had begun to identify the elusive "God spot," and suggested that it is possible that we are indeed hardwired to seek God. For example, they wrote: "All that may be new here is an analysis that finds in the human brain a mirror of these imagines Dei – all these images of God – and thus may suggest further ways of comprehending them" (my italics).⁵⁶ The point about this quotation is that it takes us back directly to our central topic, namely, that this may be seen as the physical embodiment of the image of God in humans.

A more recent advocate of the temporal lobe as the elusive "God spot" is writer and researcher Willoughby Britton. Reporting on Britton's work, Julia Keller wrote that "the temporal lobe, Britton said, is considered 'the God module,' the part of the brain that connects with the transcendent."⁵⁷

Others look elsewhere in the brain. Osamu Muramoto, a research neurologist, describes his interest in what might lead one to become hyper religious. He writes:

Hyperreligiosity may stem from increased activity in the medial prefrontal cortex of the brain ... my theory is that the medial prefrontal cortex plays the role of the conductor of an orchestra in religiosity.⁵⁸

Others are more cautious in their interpretations. For example, Mario Beauregard who works in the departments of radiology and psychology at the Université de Montréal is reported by Christopher Stawski as saying:

Obviously, the external reality of God can neither be confirmed nor disconfirmed by delineating neural correlates of religious/spiritual/mystical experiences. In other words, the neuroscientific study of what happens to the brain during these experiences does not tell us anything new about God.⁵⁹

Neither, I believe, does it lend any support to a view that by locating the "God spot" in the brain it supports the claim that this is the true meaning of the image of God in humans. There is no biblical warrant for such a view.

A similar point was made emphatically by the distinguished Jewish physician Jerome Groopman, who was concerned about some of the motivations for neurotheology. He wrote: "Why do we have this strange attempt, clothed in the rubric 'neurotheology,' to objectify faith with the bells and whistles of technology?"⁶⁰ And he goes on: "Man is a proper subject for study in the world of science. God is not."⁶¹ While acknowledging that we cannot dismiss the possibility that we are intrinsically wired for spirituality, Groopman wisely notes that "as has been the case with all attempts to 'prove' the presence or intent of God, SPECT (brain) scans and cerebral anatomy fall far short of doing so."⁶² And he concludes: "Indeed to believe that science is a way to decipher the divine, that technology can capture God's photograph, is to deify man's handiwork. And that, both religious mystics and scholars agree, is the essence of idolatry."⁶³

Earlier we mentioned the high profile neurologist V. S. Ramachandran. Most recently he has put us further in his debt by offering a balanced assessment of how to evaluate the many claims being made today of the power of neuroscience to "explain everything." In his new book *A Brief Tour of Human Con-*

sciousness: From Impostor Poodles to Purple Numbers, he discusses the cognitive, neurological, and evolutionary basis for our appreciation of visual art.⁶⁴ In an interview with him in *The Psychologist*, the interviewer asks:

But isn't the biological grounding of that (the craving for transcendence)—by saying it's stimulation of the temporal lobe—diminishing to the value of the experience?

Ramachandran replies:

No. It only takes care of two of the three questions we need to ask as scientists. It takes care of what it is, of what produces it. It takes care of the biological anchor. But it doesn't say why the function is: why does it help the organism? ... with transcendence, I can't tell you why ... There's something going on that we don't really understand.⁶⁵

There are no faith shattering stakes in the beginnings of a better understanding of the neurological and evolutionary origins of a capacity for transcendence. Neither is there scriptural warrant for claiming that such a capacity is what is meant by the *imago dei*.

The *Imago Dei* as a Unique Capacity for Personal Relatedness

To focus on the capacity for personal relatedness is another way of describing what in the past has been alluded to in discussions of the societal nature of the divine image. Sinclair Ferguson, referred to earlier, has pointed out that some of the leading theologians of the last century such as Brunner and Barth both emphasized that the image of God is not the possession of the isolated individual but of the person in community. Barth developed the idea characteristically in a Christocentric manner. More recently theologian Colin Gunton has stated quite explicitly that "*to be a person to be made in the image of God it is in our relatedness to others that our being human consists*" (my italics).⁶⁶

It is interesting that a similar focus on relatedness is found today in the writings of neuropsychologists and evolutionary psychologists. Warren Brown, for example, has written: "A theory of mind is involved in extending our relatedness both to others and to ourselves."⁶⁷ And evolutionary psychologists Byrne and Cork have written that "learning in social contexts may be constrained by neocortical size" and that "neocortical expansion has been driven by social challenges among the primates."⁶⁸

But the capacity for relatedness is not some capacity free-floating above the head or out there in space. The evidence from neuroscience and evolutionary psychology both point to the beginnings of an understanding of the neural substrates required to be functioning normally for the possession of a full capacity for personal interrelatedness. To give one example, one of the most significant

neuroscience discoveries in the last decade was the identification of a small specialized group of neurons in the frontal part of the brain. These "mirror neurons," discovered by Giacomo Rizzolatti and his colleagues, seemed to be part of the essential substrate for interpersonal interactions.⁶⁹ Ramachandran has predicted:

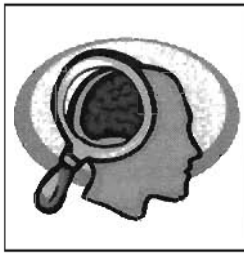
Mirror neurons will do for psychology what DNA did for biology: they will provide a unifying framework and help explain a host of mental abilities that have hitherto remained mysterious and inaccessible to experiments ... and thus I regard Rizzolatti's discovery as the most important unreported story of the last decade.⁷⁰

The capacity for relatedness, if this is to be seen as the key to understanding the imago dei, is itself dependent upon our wholeness as persons and intimately dependent upon our biology. It is an embodied capacity.

It is already evident from further research that these mirror neurons are part of a wider network upon which the capacity for personal relatedness depends. The evidence for this comes from ongoing studies of the brains of autistic individuals. It is widely known that one of the difficulties experienced in some forms of autism is the capacity to relate to other people. It is already evident that in certain autistic individuals the brain is functioning abnormally as compared with controls when they are performing tasks, which are normally known to mobilize the so-called mirror neurons. It will be some time before the full details have been worked out experimentally and they will undoubtedly turn out to be far more complicated than at the moment we suspect. However, the important point here is that the capacity for relatedness, if this is to be seen as the key to understanding the *imago dei*, is itself dependent upon our wholeness as persons and intimately dependent upon our biology. It is an embodied capacity.

The Way Ahead

Writing about "The Image of God," Sinclair Ferguson notes that "specific references to man as the image or likeness of God are infrequent in Scripture" ... but that ... "while statistically the phrase is infrequent, the interpretation of man which it enshrines is all pervasive."⁷¹ He reminds us that



*As scientists
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Article

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a wide variety of interpretations of the *imago dei* is found in the history of theology and that it is a human being as a human being and not some element of his or her constitution or make-up which constitutes the divine image. A proper understanding of the doctrine of the image of God, he says, is an essential groundwork to formulating and understanding a proper Christian response to wider concerns such as ecological, humanitarian, evangelistic, and apologetic concerns. He emphasizes that humankind is always to be approached in his totality and not in terms of his parts.

With Ferguson's guidelines in mind—especially that while the references to the image or likeness of God are relatively infrequent in Scripture, nevertheless the interpretation of humans which it enshrines is all pervasive—we have reviewed some of the interpretations which, down the centuries, have been accepted as being central to a proper understanding of the meaning of the image of God in humans.

On the one hand, we have discovered—perhaps surprisingly to some—that many biblical scholars and theologians have urged us to remember the views of the distinguished North American theologian Jonathan Edwards. In his recent biography of Edwards, George Marsden wrote:

Edwards regarded Scripture alone as truly authoritative, so earlier interpreters could be revised. The project of understanding Scripture's true meaning was an ongoing progressive enterprise to which Edwards hoped to contribute.²²

This is indeed a timely reminder. It is Scripture that is authoritative not the interpretation given by a particular group of Christians at a particular time. As scientists who are Christians, we believe that using the talents God has given us, we have been enabled to discover more and more about the wonders of his creation. We also believe that ultimately the truth that we discover in this way will not contradict nor conflict with the truth that has been revealed in Scripture. However, as the history of the interactions of science and faith have amply illustrated, from time to time, the discoveries we make from within science prompt us to re-examine some of our earlier interpretations of

Scripture. As always we need to listen carefully to what God is telling us through science in order to interpret and understand Scripture properly.

Relating this to our specific topic of current concern, namely our understanding of the image of God, we have noted that it has been the very rapid developments in neuroscience and evolutionary psychology that have proved to be most relevant to our understanding of human nature, and these which therefore have shed new light upon our understanding of ourselves. As a result of this new knowledge, we have learned to recognize certain things:

1. A holistic model of the human person does most justice to the scientific understanding of ourselves. Dualisms of parts or substances will not do. There is no scientific evidence for them, and there is no biblical warrant for them. Our unity is central. We know each other, not as brains ensheathed in bodies, but as embodied persons. We are people who relate to each other as beings created in the image of God. This image is not a separate thing. It is not the possession of an immaterial soul. It is not the capacity to reason. It is not the capacity for moral behavior. It is not the possession of a "God spot" in our brains.
2. The various capacities claimed in the past to discriminate uniquely humans from animals have now been seen to be present in rudimentary forms in animals.
3. Believing that all truth comes from God, we can, as Christians who are scientists, marvel at what we discover and be relaxed about the increasing wonders revealed every day about the most intimate details of human nature. What we already know will seem small in the light of what will be revealed in the coming decades, which will add even further to our conviction that we are indeed "fearfully and wonderfully made."
4. We are seeing that the contemporary focus of theological thinking is to see the *imago dei* as evidenced in our capacity for relatedness: to our Creator, to one another, and to the creation of which we have been made responsible stewards. To understand and accept this has enabled us to recognize the need to show greater compassion to those struggling to make and then maintain normal interpersonal relations. Above all,

Scripture teaches that we have a special calling and destiny—a calling to a personal relationship of love and obedience to our Creator and a destiny to fulfil his invitation and command to be faithful stewards of his creation.

But as Christians we cannot leave it there. As biblical scholars and theologians are reminding us today, any attempt to interpret and understand the *imago dei* without reference to the Lord Jesus Christ falls far short of what Scripture teaches. It is in him and him alone that we have the clearest vision of what the *imago dei* is and how it is to be understood. For example, Old Testament scholar Patrick Miller, after reviewing the evidence from the Psalms concerning what it means to be a human being and then comparing this with the book of Hebrews, has written:

The writer to the Hebrews hears in the Psalms the word that whatever we say about the human reality must take into account the face of Jesus Christ. The New Testament underscores this in spades when it makes Psalm 22, the model lament, the interpretive key to understanding the passion and death and resurrection of Jesus Christ.⁷³

He later goes on: "The Hebrews writer says the critical words 'But we do see Jesus.'" *"We do see Jesus, who for a little while was made lower than the angels, crowned with glory and honor because of the suffering of his death, so that by the grace of God he might taste death for everyone"* (Heb. 2:9).

And he later continues:

Whatever therefore is to be said about the human cannot be confined to general statements about humanity apart from God. It cannot be said apart from the discovery that in Jesus Christ we see who we are and we also see God for us. And what he said about the human cannot be said as a general statement that assumes that what we see now is all there is to see. The answer to the question about who we are is finally eschatological, where tears are no longer part of the human reality, where joy is the order of eternity, and where our transience disappears in the disappearance of death. We cannot see that yet. But we do see Jesus. That will have to do. I think it is enough.⁷⁴

And for me it is certainly enough.

A similar note is sounded by New Testament scholar Joel Green who writes:

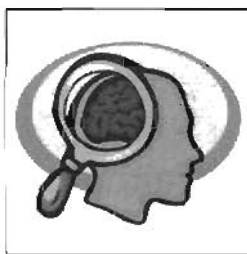
The image is not located in any of these (possession of a soul, etc.) but in our human vocation, given and enabled by God, to relate to God as God's partner in covenant. To join in companionship of the human family and in relation to the whole cosmos in ways that reflect the covenant love of God. This is realized and modeled supremely in Jesus Christ.⁷⁵

Some Implications for Faith and Practice

Lest it be felt that consideration of how best to understand the *imago dei* is a purely academic exercise, it is, at this stage, timely yet again to recall the words of Ferguson. He reminded us that a proper understanding of the doctrine of the image of God is an essential groundwork to formulating and understanding a proper Christian response to wider concerns. These included humanitarian, evangelistic, apologetic, and ecological concerns. For Ferguson, all of this was predicated on the assumption that "humankind is always to be approached in his totality and not in terms of his parts."⁷⁶

As regards humanitarian concerns, we have noted that our spirituality is embodied. This is well illustrated in studies of the brain processes involved in prayer, meditation, and reflection on the transcendent. As with most biological processes, it reminds us once again to keep in mind their variability within any large population and thus the need to recognize our differences. It is entirely possible that in due course some of the findings from neurotheology will provide further pointers to why some people are plagued with bizarre religious thoughts and hallucinations. A better understanding of this may in turn make it possible to bring relief to some of our brethren by the use of appropriate psychotropic drugs. A similar thing already has occurred as we have at last begun to understand and accept that the onset of depression in some of our Christian friends has nothing whatever to do with spiritual disobedience but rather with disordered biochemistry. In short, further research may foster greater understanding and lead to greater compassion within our Christian communities.

But what about pastoral care and counseling without a soul? Stuart Palmer has argued that any dualistic conception of "soul" is unnecessary for the existence and vitality of the field of pastoral counseling. He believes this view is supported not only by consideration of the evidence from neuroscience but also is backed by a serious consideration of the implications and benefits of a Trinitarian theology.⁷⁷ It is not only some scientists who are reductionists. It is possible in offering pastoral care, traditionally described as "soul care," to bring in hidden assumptions about the basic make-up of persons wherein concentration on the "soul" is everything. Indeed some act as if expressions of spirituality are reducible without remainder to psychological phenomena. Others believe that the psychological dynamics of life can be reduced without remainder to spiritual explanations. Palmer has argued that neither does justice to the relevant evidence. People are physical beings, vulnerable to changes in their biology, including such changes as those in concentrations of neurotransmitters and, at times, associated depression.



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Article

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Likewise we have gained a better understanding of some of the agonies that devout Christians pass through as they struggle with the effects of Alzheimer's disease upon their Christian life and discipleship.⁷⁸ This further underlines the intimate interdependence of all aspects of our complex natures. People are social beings. We need horizontal relationships. We need community support. People are made by God and for God. Though finite creatures, we are invited into a vertical relationship with the infinite divine Creator. Therein lies part of the relevance of a fully Trinitarian theology.

In similar vein, when considering specifically the implications of advances in neuroscience for Christian counseling, Virginia Holeman has noted:

The view of personhood that takes the tightening in mind-brain links seriously leads to a particular understanding of the metapurpose of Christian counseling with specific attention to the role of the Holy Spirit in general and the counseling relationship in particular.⁷⁹

For Holeman, it is the capacity for relationships, central to the understanding of the *imago dei* which is all-important. She writes:

It is not the external strategies that define Christian counseling, but the agency of the kingdom of God in the lives of counselors who seek to bring this healing reality to bear upon the lives of clients. The person of the therapist-in-relation-to-God brings the Christian into Christian counseling. In effect, Christian counseling is less about technique and more about relationality.⁸⁰

As regards apologetic concerns, the brief look at the way that research in neuroscience and evolutionary psychology are progressing has alerted us to the need to come to a better understanding of the habitual ways of thinking about human nature widely shared by our neuroscientist and psychologist colleagues. We shall be especially sensitive to the need not to create unnecessary hurdles for them to jump over as they seriously consider the claims of Christ. We shall not, for example, demand, without any scriptural warrant, that they must believe that each of us is a package made up of soul and

body stuck together in some ill-defined way rather than recognizing ourselves as psychophysical unities. We shall also certainly be careful how we use our "soul talk."

As regards evangelism, we are greatly helped by the writings of missiologist Michael Rynkiewicz.⁸¹ While remembering that "soul talk" remains an essential part of our Christian heritage, we need to work hard to endow it with a fully biblical meaning rather than one that owes more to the pervasive influence of western philosophy and theology than to Eastern Orthodox theology with its emphasis on relationships. It remains the case that many of our favorite hymns embody a tacit belief in "the soul" as some separate part of us. It is my "soul" that is saved as I personally receive Christ as Savior and Lord. It is my "soul" that with all the other redeemed souls will gather round the throne of grace in heaven to continue our praise and worship. Thus it was for centuries "the saving of souls" that motivated our illustrious forebears, those wonderful pioneering missionaries of past generations.

Rynkiewicz alerts us to the fact that "a dualism that allows missionaries to separate evangelism and social justice is contrary to the *missio dei*."⁸² He further reminds us that we are so imbued with the premises of western ideology about persons that it is only by listening to missionaries that we are forced to remember that other cultures have other assumptions. And personhood is conceptualized differently in other cultures. He asks the question:

Is there, for example, the same autonomous individual in all cultures who can make a decision and come forward alone to register that decision or must conversion be conceived in a different way? Rather would conversion be the giving of oneself to receive from God in order to establish a new relationship or is it just the acquisition of some new knowledge.⁸³

Some missiologists, he notes, "have argued that the real issue is relationship, not knowledge, not scholarship." Rynkiewicz urges us to remember that "our mission is not to convince the world that we have the truth with regard to the construction of personhood, but to introduce Christ as a person seeking relationship, to invite people to

receive God's grace, and to enter into a new community through the Holy Spirit."⁸⁴

Rynkiewicz writes further, and to some somewhat provocatively, that perhaps "many Protestant missionaries seem to think that the job is to impart words, knowledge, and creed." But this he says "is a pale reflection of 'the word became flesh and lived among us.'" Rather he emphasizes that "the incarnation involved God coming to humans in a recognizable form so that those who embraced the message may 'have fellowship with us; and truly our fellowship is with the Father and with his Son Jesus Christ.'"⁸⁵ Are we in danger, he wonders, of reifying and deifying our own culture? There is much provocative food for thought here.

Finally, Ferguson also drew attention to implications of our understanding of the *imago Dei* for our current ecological concerns. In recent decades, there has been increasing involvement by Christians in expressing and meeting such concerns. This is certainly a proper response to the understanding of the *imago dei* focused on by many and spelled out so clearly by Colin Gunton. Gunton writes:

To be in the image of God is at once to be created as a particular kind of being—a person—and to be called to realize a certain destiny. The shape of the destiny is to be found in God-given forms of human community and of human responsibility to the universe.⁸⁶

Noting that "human difference from the rest of the creation does not lie in some absolute ontological distinction, but in an asymmetry of relation, and therefore a relative difference," Gunton reminds us that "as created beings, human persons are bound up closely with the fate of the rest of the material universe, as stewards rather than absolute lords."⁸⁷

This understanding of the essence of what it means to be made in the image of God leaves us with two questions that we all must answer: (1) Have we responded to our calling and accepted the personal relationship into which we are invited by God through Jesus Christ? and (2) Are we fulfilling our destiny as faithful stewards of his creation? ♦

Acknowledgments

An early draft of this paper was read and commented on by Professors David Myers (Psychologist), Hope College, USA; Christopher Seitz (Old Testament and Hebrew) and Alan Torrance (Systematic Theology), University of St. Andrews, UK. Their corrections and helpful suggestions are incorporated in this version, and I am most indebted to them. I am also most grateful to this journal's anonymous reviewers who clearly read the manuscript very carefully and whose reports enabled me to make further necessary corrections.

Recommended Readings

In the descriptions of "bottom-up" effects and "top-down" effects given in this paper, it was possible, in the space available, to give very few examples. For the reader interested in further details of both "bottom-up" effects and "top-down" effects, examples from the current neuroscience literature, from the molecular level up to the level of neural networks and whole systems, is available in more extensive reviews I have given recently in several places. The following are the most easily accessible.

"Mind Reading and Soul Searching in the 21st century: The Scientific Evidence," chap. 2 in *What about the Soul?* ed. Joel Green (Nashville, TN: Abingdon Press, 2004).

"Human Nature without a Soul?" *European Review* 12, no. 1 (2003): 45–64.

For the reader interested in recent writings by biblical scholars on some of the supposedly more problematic passages of Scripture traditionally interpreted in a dualistic way, there is a series of chapters by Old Testament and New Testament biblical scholars in *What about the Soul?*

Notes

¹J. B. Green, "Resurrection of the Body: New Testament Voices Concerning Personal Community and the Afterlife," chap. 7 in *What About the Soul?* ed. Joel Green (Nashville, TN: Abingdon Press, 2004).

²St. Augustine, *Confessions*, book XI.

³D. Hubel, "The Brain," *Scientific American* (September 1979): 45–53.

⁴D. M. Buss, *Evolutionary Psychology: The New Science of Mind* (Boston, MA: Allyn and Bacon, 2000).

⁵F. Crick, *The Astonishing Hypothesis* (Old Tappan, NJ: Simon and Schuster, 1994).

⁶F. Crick, "After the Double Helix: Unraveling the Mysteries of the State of Being," *The New York Times* (April 13, 2004).

⁷L. G. Stone, "The Soul: Possession, Part, or Person? The Genesis of Human Nature in Genesis 2:7," chap. 4 in *What about the Soul?*

⁸W. S. Brown, N. Murphy, and H. N. Malony, eds., *Whatever Happened to the Soul?* (Minneapolis, MN: Fortress, 1988).

⁹P. D. Miller, "What Is a Human Being? The Anthropology of Scripture," chap. 5 in *What about the Soul?*

¹⁰J. Green, "Body and Soul? Questions at the Interface of Science and Christian Faith," chap. 1 in *What about the Soul?*

¹¹C. Westerman, *Genesis 1–11*, trans. John J. Scullion, S.J. (London: SPCK, 1984), 158 ff.

¹²G. Von Rad, *Genesis*, trans. John H. Marks (London: SCM Press, 1961).

¹³Westerman, *Genesis 1–11*.

¹⁴Ibid.

¹⁵Ibid.

¹⁶J. Green, "Body and Soul?"

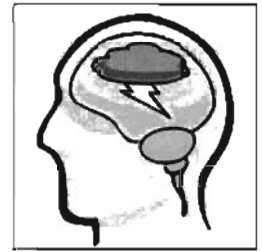
¹⁷J. C. Eccles, *Evolution of the Brain: Creation of the Self* (London: Routledge, 1989).

¹⁸R. Sperry, *Brain Circuits and Functions of the Mind: Essays in Honor of Roger W. Sperry*, ed. Colwyn W. Trevarthen (Cambridge: Cambridge University Press, 1990), 382–5.

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Neuroscience, Theology, and Unintended Consequences

David F. Siemens, Jr.

Most contemporary neuroscientists hold that soul or mind is no more than what emerges from complexly organized matter, that is, is strictly a function of brain. While not necessary, this view has been adopted by some evangelicals who seek current relevance. They, of course, have to posit a nonmaterial deity, something clearly not part of science. Their claims have been disputed on grounds of incompatibility with the resurrection, with spiritual beings, with free will, and with eternal life. None of these criticisms has noted an even more fundamental problem: nonreductive physicalism apparently makes the Incarnation impossible.¹

*Flies will easily fly into honey – their problem is how to get out.
– Persian proverb.²*



David F. Siemens, Jr.

Theologians have long argued about soul and spirit as parts of human existence. They have been sure that these elements are immaterial, but they have been divided over whether they are distinct, that is, whether human beings are composed of two substances, body and soul, or of three, body, soul, and spirit. Philosophers since Descartes have generally applied only one term, mind, to whatever these immaterial entities may be. Contemporary neuroscientists commonly believe that soul is no more than a set of functions of complexly organized matter, that is, the brain and its associated organs, affected by the social environment.

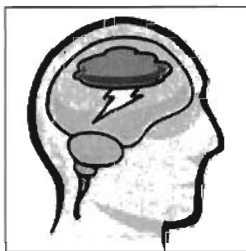
We may consider this complex as analogous to a computer. A little chunk of silicon with various trace elements, a small amount of copper and other metals, some small sheets of fiberglass: these do nothing in simple or undifferentiated lumps. But when the copper is laid out in precise patterns on the fiberglass sheets, and the silicon is precisely and minutely patterned and connected properly to the motherboard and other parts, we have a computer which will manipulate input according to the precise patterns specified by programs and then output results much

faster than human beings can do such tasks. Neurons, of course, are more complicated and more complexly interconnected, but have been called wetware, the counterpart to the computer's hardware and software.

My first computer, back in the late 70s, was a Sanyo MBC1000. It had a Z80 CPU until I upgraded to a V20. The processor had a couple myriads of transistors, ran at about 4MHz using CP/M as its operating system. With only 64K RAM, it handled tasks in part by shifting bytes to and from 360K 5¼-inch floppies, the only storage medium. I often had to switch floppies to complete a task. In contrast, current CPU chips have tens of millions of transistors operating at gigahertz frequencies; that is, three and six orders of magnitude greater, respectively. The amount of RAM is three or more orders of magni-

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David Siemens, the son of missionaries, earned a doctorate in philosophy from Claremont, having studied with an outstanding logician, the late E. John Lemmon. In that process, Dr. Siemens learned to examine presentations and viewpoints for underlying assumptions and logical consequences, for consistency and completeness. Believing that the integrity of a Christian world view motivates one to honestly face science, revelation, and human experience in all their ramifications, Dr. Siemens presents this reflective article. After teaching philosophy for years, David was welcomed to new activities at Canyon Institute for Advanced Studies in Phoenix. An ASA Fellow, he lives in Mesa, AZ, with his love, Esther, his wife for 59 years. He can be contacted at djsiemensjr@juno.com.



Article

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*It is reasonable
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tude greater, not to mention hard disks with amazing capacities. Whereas I was blessed to have a full line appear on the monochrome monitor (some had room for only forty characters), now monitors can handle millions of colors and letters of many sizes. Yet with all the increase of speed and complexity, in 2001 Hawking noted that the latest computers are not yet up to earthworm level.³ Since I have not yet heard of trained annelids, I believe that AI investigators have a very long way to go.

If the brain is viewed as wetware, and perception, memory, thought, emotions, and so forth are held to be no more than functions of this wetware, the result is a form of monism or physicalism. It is not necessary to hold this view: Nobel laureate Sir John C. Eccles and others are still dualists.⁴ Nevertheless, dualists are in the scientific minority. Hence it is reasonable to expect those Christian philosophers, psychologists, neuroscientists, and the like, who aspire to scientific credibility, to accept physicalism, specifically nonreductive physicalism, which may be described as materialism with a deity. It is probably best expressed in *Whatever Happened to the Soul?*⁵ Its best-known representative is probably Nancey Murphy, professor of Christian philosophy at Fuller Seminary. However, Donald M. MacKay, the Scot investigator, earlier espoused it,⁶ as do many other neuroscientists and some theologians.

Various aspects of nonreductive physicalism have been criticized. For most orthodox Christians, the dismissal of Scripture passages that conflict with monism are perhaps most important. Hasker notes this problem, as have a number of individuals who have heard Murphy speak.⁷ He notes that she, without any explanation, denies that there is any problem, on her view, with a person surviving death. He has argued at length that physicalist accounts of the resurrection are logically incoherent.⁸ Another critic noted that there is a problem with angels.⁹ Equally problematic are the scriptural references to Satan and demons, for the only spirit specifically accounted for in nonreductionistic physicalism has been God. Larmer presents a more extensive survey of the justification of physicalism and the problems from a Christian viewpoint.¹⁰ He notes that proponents of monism claim

that dualism runs counter to Hebrew thought and was imported from Greek secular sources, and that it runs counter to contemporary views which claim to encompass all relevant knowledge. He explicitly denies the first of these claims and goes on to insist that it "has implications that contradict central tenets of the Christian faith."¹¹ He argues that the monistic view may describe the various human activities but cannot explain them, especially since teleology is involved.¹² Further, this scientific view is incompatible with human freedom¹³ and with the Christian doctrine of eternal life.¹⁴ Toward the end of the essay he notes:

The search for material causes scarcely implies that all events have physical causes. Neither is it the case that the action of an immaterial mind upon a material body would violate or suspend any law of nature.¹⁵

The sum of the discussion is that, on any rational view, a living human being is a psycho-physical whole in a social environment. Mental activity affects the body, and physical conditions produce mental consequences. Both the mental and the physical are influenced by the external environment. A person is a unified entity. However, none of the matters noted above are sufficiently serious to be termed patently heretical.

There is a problem that cuts deeper than disagreements over how a person can retain identity through death and resurrection. I have not encountered a mention of it in any of the studies except my own.¹⁶ While it is easy to say that the soul survives and will be united to a new body, we have not interacted with disembodied souls. So, as far as empirical evidence goes, there may be none. To be sure, some folks report interaction with unembodied forces, and Scripture reports encounters with angels and demons, but I know of no scientific observation of such experiences.

The deeper difficulty connects to a matter implicit in the earliest creeds and explicit in the original version of the Nicene Creed.

We believe ... in One Lord Jesus Christ, the Son of God, begotten of the Father, only-begotten, that is, from the substance of the Father, God of God, Light of Light, Very God of Very God, begotten, not made, being of one substance

with the Father, by whom all things were made, things in heaven and things on earth: Who for us men and for our salvation came down and was incarnate.¹⁷

This is no more than a theological statement of what we find in various passages of Scripture, for example, John 1:1-3, Col. 1:15-17 and Heb. 1:1-6. These are very clear statements of the deity of Jesus Christ. On the other hand, the nativity narratives of Matthew and Luke, along with the multiple records of his crucifixion and death, show his humanity. Philippians 2:5-11 puts both deity and humanity together explicitly:

Keep on fostering the same disposition that Christ Jesus had. Though he was existing in the nature of God, he did not think his being on an equality with God a thing to be selfishly grasped, but he laid it aside as he took on the nature of a slave and became like other men. Because he was recognized as a man, in reality as well as in outward form, he finally humiliated himself in obedience so as to die, even to die on a cross. This is why God has highly exalted him, and given him a name that is above every other name, so that in the name of Jesus everyone should kneel, in heaven, on earth, and in the underworld, and everyone should confess that Jesus Christ is Lord, to the praise of God the Father.¹⁸

To phrase all of this a little differently, the second Person of the Trinity, the Son, eternal God, emptied himself of his glory and majesty and of much of his power and knowledge, in order to be born as a human baby. He did not abandon his holiness or deity, although these were generally hidden. However, flashes showed through. This accounts for Philip's plea, "Show us the Father and we'll be satisfied" (John 14:8). Jesus' reply was simply, "Philip, after all this time together, haven't you recognized me? If you've seen me, you've seen the Father" (John 14:9).¹⁹

All this requires that Jesus of Nazareth be fully divine and fully human, totally united in his person. God, to use a philosophical term, is substance. This does not mean that he is material, our usual sense, for he is spirit (John 4:24), immaterial, but totally real. A human being, according to traditional theology, is body and soul, a joining of material and immaterial substances. They belong together, but may be separated when physical death occurs. Two similar substances can usually be joined together fairly easily. For example, either sugar or salt will mix with water to provide a uniform solution. Granulated sugar and table salt do not quite accomplish this, for the bits do not unite. One can, with the right apparatus, recognize each crystal for what it is, though it would take an inordinate amount of patience to separate the mix into separate piles. We usually think of oil and water as immiscible but, with an emulsifier, we have such combinations as cream and mayonnaise. Additionally, ultrasound may be harnessed to

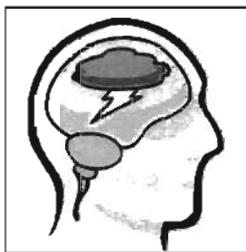
produce an emulsion. So substances, given proper conditions, can unite.

Thus one may expect that two immaterial substances could be conjoined to produce a spirit-soul or divine-human combination and that this combination could be united to a body to produce a human being. I cannot explain a mechanism whereby divine and human substances can be joined. But then I cannot explain how soul and body are united, but I experience a seamless integration. Toe, touch and taste, heart, humor and humerus, medulla, memory and merriment, are inexorably united in me. It is still *me* though I am no longer a towhead child or an adolescent student. Beyond what I remember, I am told that there is a continual turnover of atoms in every part of my body, yet it is continuously *me*.

If the human soul is only a function of the physical body, we cannot join it to the nonphysical divine substance.

As I noted, we can believe that two immaterial substances may be integrated, even though a miracle is obviously required. However, we cannot imagine how the mere function of complexly organized matter and a purely immaterial substance can amalgamate.²⁰ Substantial objects have functions. If the functions are compatible, two objects may be joined advantageously. I cannot, for example, run the output of a word processor through a mass spectrometer in order to obtain relevant results. The verbal or numerical data which word processors output are not input for spectrometry. But chromatography and mass spectrometry in tandem can identify individual components in complicated mixtures of many compounds. However, chromatography does not present the detailed information of a spectrograph by itself. Functions are joined only when the devices are connected — unless, of course, one invents a new device encompassing broader functionality. Similarly, if the human soul is only a function of the physical body, we cannot join it to the non-physical divine substance. We cannot view the hypostatic union as sequential processing. This means that the Incarnation is evidently impossible given nonreductive physicalism.

Is there a way out? Could God have used the human functions, controlling them without amalgamating his spirit with human function or soul? As a professor before the age of PowerPoint and inkjet printers spitting out overhead transparencies, I depended on chalk. Its function is to make a mark on a blackboard. My function in using chalk



Article

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was to communicate to the students. Chalk cannot take over the function of intelligibility, for it does not in itself possess the functions of mind. Could God have analogously used a human being, controlling it as I controlled the chalk? The simple answer to this is "Yes," for he is omnipotent. However, would God so manipulate a person? While some theologies say "Yes," most insist on free will. God taking over a person in this way is like demon possession, a usurpation of the person, not a loving and righteous action. So such a form of divine possession, God taking over mental functions, cannot provide an explanation for the hypostatic union, the unification of personalities.

The impossibility of accounting for the Incarnation given nonreductive physicalism is something too important to ignore. This apparent dismissal of the ancient universal creeds is surely not the intent of Nancey Murphy and her colleagues at Fuller Seminary, of Malcolm Jeeves, nor earlier of Donald MacKay, all avowedly orthodox. But they need to produce a clearly stated Christology, for it now appears that they are victims of the Principle of Unintended Consequences. One can be reasonably confident that, whenever vital aspects of a view are ignored or dismissed, inadvertently or deliberately, this principle will attack.²¹ ♦

Acknowledgment

I thank Malcolm Jeeves, George L. Murphy and Samuel D. Olsen for comments that improved this presentation. They are not responsible for any errors that remain.

Notes

¹A version of this paper was given at the Joint Annual Conference of the ASA, CSCA and CTS on July 26, 2004.

²Gerd de Lay, *International Dictionary of Proverbs* (New York: Hippocrene Books, 1998), 187.

³Stephen Hawking, *The Universe in a Nutshell* (New York: Bantam Books, 2002), 165.

⁴Warren S. Brown, Nancey Murphy and H. Newton Malony, eds., *Whatever Happened to the Soul? Scientific and Theological Portraits of Human Nature*; and Kevin J. Sharpe, ed., *Theology and the Sciences* (Minneapolis, MN: Fortress Press, 1998), 26, 88, 127, 139, 220.

⁵Ibid.

⁶Robert A. Larmer, "Christian Anthropology: Saving the Soul?" *Philosophia Christi* 2 (2000): 215, note 5.

⁷These include William Hasker, "Reply to My Friendly Critics," *Philosophia Christi* 2 (2000): 200.

and a number of individuals who have heard Murphy speak. Some of the problematic passages are noted by Joel B. Green, "Bodies—That Is, Human Lives: A Re-Examination of Human Nature in the Bible," in Brown, et al., *Whatever Happened to the Soul?* 149–73.

Verses held to be notably difficult for a monistic interpretation include 2 Cor. 5:6–9; 12:2–4; Phil. 1:22–26; Rev. 6:9–11. Malcolm Jeeves, at the first presentation of this study, noted that this criticism no longer holds since the publication of Joel B. Green, ed., *What About the Soul?* (Nashville, TN: Abingdon Press, 2004).

⁸William Hasker, *The Emergent Self*, Cornell Studies in the Philosophy of Religion Series (Ithaca, NY: Cornell University Press, 1999). This is summarized in *Philosophia Christi* 2 (2000): 163–6. See also —, "Reply to My Friendly Critics," 200–1.

⁹Robert K. Garcia, "Minds sans Miracles: Colin McGinn's Naturalized Mysticism," *Philosophia Christi* 2 (2000): 239.

¹⁰Larmer, "Christian Anthropology," 211–26.

¹¹Ibid., 214.

¹²Ibid., 218.

¹³Ibid., 218–21, and 218, note 20.

¹⁴Ibid., 221–25.

¹⁵Ibid., 226.

¹⁶David F. Siemens, "Thoughts on Nonreductive Materialism: A New Heresy?" *Philosophia Christi*, 4 (2002): 519–23.

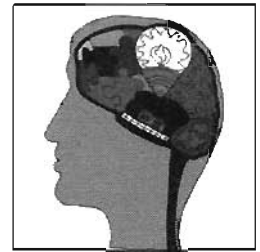
¹⁷This dates to 325. What is commonly called the Nicene Creed is the expansion from the Council of Constantinople, 381. What is known as the Athanasian Creed is equally clear on the relevant point. What is known as the Apostles' Creed cannot be traced back this far.

The Reformation confessions are also clear: Lutheran Augsburg Confession (1530), Art. III; Reformed Gallican Confession (1559), Art. VI and XIVf; Anglican Articles of Religion, known as the Thirty-nine Articles (1562), Art. II; Anabaptist Dordrecht Confession (1632), Art. IV. All these creeds and confessions are found in B. A. Gerrish, ed., *The Faith of Christendom: A Source Book of Creeds and Confessions* (Cleveland and New York: Meridian Books, The World Publishing Company, 1963).

¹⁸This passage comes from Charles B. Williams, *The New Testament: A Translation in the Language of the People* (1937; reprint, Chicago: Moody Press, 1952).

¹⁹These two passages are my paraphrase.

²⁰This holds whether one adopts creationism or traducianism as the source for each individual's soul. Creationism holds that God creates a new soul for each infant, granting it at conception, quickening, or birth. Traducianism holds that the soul is produced by the act that produces the zygote. That is, accompanying the physical act is a spiritual act, so that both body and soul originate and develop together. I believe traducianism because a child so obviously expresses the mental and physical traits of the parents and grandparents. Of course, God is fully able to produce such a soul. However, if human beings are fallen, then he must be producing degenerate or defective souls. Since we do not expect the deity to create such warped entities, creationism seems more consonant with Pelagianism (I can save myself with a little help) than with Augustinianism (I depend wholly on grace for salvation).



Dimensions of the Human Being and of Divine Action

Peter Rüst

Humans are three-dimensional, body-soul-spirit entities, but nevertheless unitary, indivisible persons. Animal behavior includes deterministic and random constituents. It may be modeled in terms of information systems, containing regulatory loops. Goal settings for these may be fixed, as in "lower" animals, or governed by internal adaptive supervisory systems freely selecting from alternative routines, as in conscious "higher" or "soulish" animals. A meta-supervisor in humans provides self-consciousness, free will, conscience and spiritual behavior. As with space, each further dimension includes the previous one, but cannot emerge from it or be reduced to it.

In the natural origin of each human, God providentially works through deterministic events, random ones such as mutations and neural modifications, as well as the option of selecting the outcome of some of these. This hidden feeding-in of formative information would represent the fundamental novelty implied by God "creating" the individual.



Peter Rüst

Epistemology for Scientific and Theological Realities

Our world, including human nature, can be studied by both science and theology. Although the kinds of data are different, plausible interpretations, concordant with reality, will harmonize. As human nature is God's creation, its essence is closely connected with its origin in God's action. Interestingly, parallels between facets of God's activity and dimensions of human nature can be detected in hints from Scripture and science.

What is the essence of human nature?¹ Can we know it? And can we know *how* God made humans collectively and is making humans individually? What does it mean to be human? Human nature has different aspects or dimensions, like body, soul, and spirit. Science provides biological and some psychological descriptions, and the Bible's definition of humanness is spiritual: "created in the image of God."²

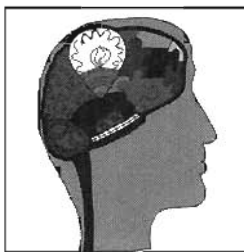
Is it possible to combine these aspects into an integrated, harmonious picture? Or would this be an unreasonable, futile quest? After all, by definition, science is incapable of dealing with spiritual realities revealed in

the Bible, and the purpose of the biblical revelation is not scientific information. Perhaps inserting "God did it" into gaps of scientific knowledge might risk positing a "god-of-the-gaps," whose relevance diminishes with increasing scientific knowledge. But more seriously, one would risk suggesting that God is *not* working through natural, scientifically knowable processes, as well.

But as God is the Creator or Author of both the natural (or visible) and the spiritual (or invisible) realms, it is indeed reasonable to look at reality from both a scientific and a theological perspective, expecting to find an integrated, harmonious, or complementary picture. Implicit in this endeavor is the assumption that God works through *all* processes, whether knowable or not, whether natural or supernatural. Of course, this does not make God responsible for moral evil.

As God is the Creator or Author of both the natural ... and the spiritual ... realms, ...[we can look at reality and expect] to find an integrated, harmonious, or complementary picture.

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Where he allows personal creatures like humans to freely decide on their own about some action, they are given a corresponding responsibility.

In trying to find such a harmonization of scientific and theological aspects of human nature, we must be careful to distinguish the data from their interpretation. For the theological aspect, the biblical texts in their original form present the only relevant, primary data. For the scientific aspect, it is observations and measurements reported in the primary literature. Spiritual realities are eternal given facts, but their theological interpretation, as a human endeavor, is error-prone. Natural realities are given facts of creation, but science which investigates and interprets them develops, changes, and is influenced by many human deficiencies. This implies that any integral model can never be final, but has to be reviewed, discussed, and corrected as new data or insights become available.

Would such a model be nothing but a complementary set of two separate, fully independent descriptions?³ Ideally, science has to produce identical results, independently of the different world views or religious commitments of investigators, so that peer review, confirmations, and refutations are possible on the basis of generally accessible data. This implies that science must use methodological naturalism, respecting as off-limits any metaphysical contents, whether they be Christian, atheist, or whatever.

On the basis of its epistemological and ethical commitments, the Christian faith certainly provided an excellent starting position and environment for doing creative and productive science—which is why modern science originated and grew in Europe after the Reformation, when biblical thinking was emphasized instead of the former appeals to authorities.⁴ Nevertheless, when doing science, Christian researchers will not try to introduce biblical revelation—even where there are no reasons for questioning its reliability—but will build on data accessible and acceptable to everyone.

At first sight, such methodological naturalism is just as applicable to entities mentioned in the Bible. The Bible does not restrict itself to theology, but reports and

mentions anything relevant to God's salvation history. This includes aspects of the creation, human nature, medicine, history, sociology, politics, ethics, and so forth. Of course, such biblical statements may be data for science, even if merely taken as records of human opinions, on a par with extra-biblical data.

There is a catch, however, when fields like Bible exegesis, philosophy, metaphysics, and in particular—in the present context—human specifics are concerned. In these realms, pure methodological naturalism might miss important data, because these areas are inseparably linked with theological aspects.

Theology must take seriously even those biblical statements or passing remarks which seem to lack theological relevance. Although the primary focus in the Bible is always a theological one, apparently non-theological details may not simply be disregarded as nothing but ancient opinions, because the theological core is qualified by its environment. It just may be that, in a given context, God wanted to commit to writing some theological aspects indissolubly bound up with "natural" data.⁵ The outstanding example for this is the historicity and bodily nature of the resurrection of Jesus. Belief in an ultimately divine authorship of the *entire* text of the biblical originals must be the guiding hermeneutic, if the theological core is not to be compromised or even lost.

As a consequence—if there is divine inspiration at all—one is often forced to think about harmonizing biblical statements with other data. Any neat compartmentalization would be inadequate or even misleading. In this sense, I shall use data from nature and from the Bible, taking into consideration their respective characters, intents, or weights in dealing with the question of the nature of humans and their creation. It would be inappropriate to consider human nature in a scientific context alone, because it is defined by God's having created humans "in his image."

In referring to biblical texts, the term "to create" shall here be restricted to translating the Hebrew *bara'* (or the Greek *ktizo*), which implies God creating something fundamentally new out of nothing. On the other hand, God (or humans) may "make" (Hebrew

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^*asah*) something using a precursor object.⁶ God may use both modes of operation on a creature. He may “create” something, e.g., the universe, and then “develop” it further by “making” galaxies, stars, and other things in it, using “natural” processes made possible by what he created in the beginning. Or he may “make” (or develop) a preexisting entity and, at a certain point in time, “create” in it a novel dimension not derivable from anything previously available. I believe that this is what has happened in God’s creating humanity in his own image.⁷

Scripture teaches that God not only created humanity, but also that he creates each human individual.⁸ What does this mean? I believe that this similarly indicates some combination of natural and supernatural processes.

Dimensionality of Living Organisms

The human species is apparently the result of a long process of evolution. This process is punctuated by some discontinuities which science finds hard to deal with, such as the origins of life, of sentience, and of self-consciousness. If the stages delimited by these punctuations are taken to be different dimensions, the Bible has some surprising help to offer. This is not to say that “the Bible teaches modern science,” but that biblical texts may allow for an interpretation which harmonizes with aspects of reality of which its human authors may have been unaware – as was the case with various prophecies.

Even on the simple level of space-time, different dimensions are clearly distinct, yet intimately interconnected in the total reality. Each of these dimensions transcends and pervades the ones previously considered. I propose to view the mystery of human nature and of its relationship to God’s creative activity in terms of different dimensions: body, soul, and spirit—somehow analogous to the dimensions of space-time. These human “dimensions” are embedded in space-time but transcend it. Similarly, the soul is embedded in the body but transcends it, and the spirit is embedded in the soul but transcends it.

Four-dimensional space-time is first augmented by the dimension of biological semantic information,⁹ generating biological life—the body. Starting with such “lower” life, the sentient, psychological, or “soulish” dimension produces higher animals (or “living souls”¹⁰). These include hominids up to *Homo sapiens*. When God’s image was created in this hominid,¹¹ the new spiritual dimension made *Homo sapiens* truly human in the biblical sense. To be precise, we are not sure at what stage of hominid evolution this happened.

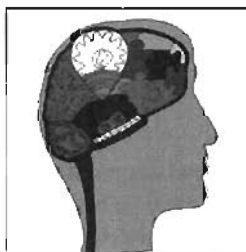
Being created in God’s image applies to all humans. A further dimension—a fourth human dimension beyond body, soul, and spirit—is eternal life, given to believers at conversion. Those humans who receive this eternal or spiritual life by faith become children of God.¹²

On a scientific level, these dimensional augmentations are not explained. They are usually believed to represent, at most, higher levels of complexity gradually emerging, rather than new dimensions.¹³ The origin of life remains a complete mystery, and so are the origins of the psychological and spiritual realities. The psychological realm is usually treated as a property of neural activities in the brain. Anything called “spiritual” is equated with psychological aspects, without distinguishing between what I labeled as the second, third, and fourth human dimensions. I base their distinction on biblical indications, and they conform to experience. New dimensionalities for the origins of higher animals and of humans are compatible with the use of the term “create” in Gen. 1:21 and 27.¹⁴

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All living organisms descended from one or a few original simple living systems by the Darwinian process of random mutations and natural selection—a view fully compatible with biblical theology if God is seen as “making” (or evolving) all species fully or partially through natural processes.¹⁵ The strongest evidence for common descent of different species consists of shared errors, like certain mobile genetic elements inserted at exactly corresponding positions in their DNAs. If such an element was inactivated before the speciation event leading to the species compared, the homology cannot be attributed to identical needs of the two species, but can only testify to their common descent. The same argument applies to other errors like deletions, mutations to stop codons, and frameshifts.¹⁶ Many such homologies have recently been found between humans and apes.¹⁷

Thus, as a consequence of the extensive genome sequencing efforts of the last few years, the “fact of evolution,” which has been touted for almost one hundred fifty years without stringent support, now at last has become



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virtually incontrovertible. Yet, in two respects, it is still unknown whether the known mechanisms of evolution are adequate.

First, the origin of life is very far from being formulated in a plausible model. It is premature to call life an "emergent property" of chemical systems. I do expect living systems to have a corresponding chemical description. But whether and how chemistry can "cause" life is still pure speculation.¹⁸

Second, the evolutionary emergence of novel functions is still a mystery. Once self-replicating systems with heritable genomes exist, it is conceivable that new functional sequences emerge by Darwinian mechanisms. But natural selection presupposes a minimal functionality as a selectable substrate. How can novel molecular sequences of minimal functionality originate spontaneously out of ones completely lacking the function under consideration? Are they accessible through mutational random walks in the huge sequence space?¹⁹ Theoretically, a sufficient density and contiguity, in sequence space, of every functional specificity required might solve the problem. But whether this situation really applies is unknown and, according to presently available data, questionable.²⁰

In this paper, I am not going to deal with these two problems. Instead, I shall try to characterize the two mysterious transitions of biological organisms which I attribute to new dimensions: the one from lower life to "higher" animals²¹ called "living souls," and the other from these to biblically genuine humans created in the "image of God." Scientific data to be considered are an organism's behavior and the structures on which it may be based.

Control of Behavior

Dimensionality in the nature of organisms may be modeled in a framework of information or control systems. But reductionism is neither implied nor logically required. A higher dimension is not uniquely determined by a lower-dimensional configuration, but it allows an additional freedom, in which novel behavior becomes possible.

What is the "soul" or psychological dimension? Is it just an "emergent property" of the nervous system evolving and growing

sufficiently complex? The simplest central nervous systems apparently are restricted to providing an information flow from sense organs to organs for movement. Let us look at the logic of such behavioral mechanisms—whatever their way of implementation—beginning with lower, not yet "soulful" organisms.

Even bacteria display nontrivial behavioral responses to their environment, like swimming toward higher nutrient concentrations. The simplest case of behavioral response may be modeled in terms of an information or control system containing a negative feedback loop. This model has been argued in detail by Donald M. MacKay.²² It consists of four logical elements:

- (1) *receptor(s)*—sensing external conditions;
- (2) *comparator*—detecting a mismatch between the receptor's indication and a preset goal;
- (3) *organizer*—activating the effector according to the comparator's decision;
- (4) *effector(s)*—producing the behavior needed.

The first and fourth elements, interfacing with the environment, may be multi-channel devices.

A manmade example of such a control system is the one used for temperature control in refrigerators. The nervous system of multicellular animals may contain many such loops. An organism's behavioral complexity is correlated with that of its central nervous system. In each regulatory loop, the comparator reacts in accordance with its goal setting. In lower animals and in some systems in higher animals, the behavioral goals of such loops are genetically fixed. The goal is set from outside the loop, as with a refrigerator whose "goal" temperature is set by turning a knob. In such loops, the organizers operate automatically. At this level, consciousness is not required, even if such lower regulatory systems reside in conscious beings. For example, the pupil of our eye adjusts automatically to the amount of incident light.

Other regulatory information systems are under conscious control. Some behavior in higher animals is not genetically fixed, and therefore more complex, requiring two additional logical elements according to MacKay.²³

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- (5) *feedforward system*—forwarding the receptor's sensory input directly to the organizer;
- (6) *supervisor*—guiding the system adaptively, adjusting the goal and the organizer's behavior.

For flexibly adapting to a variable environment, a simple on-off decision of a comparator is insufficient. An additional (possibly multi-channel) feedforward system provides the organizer with direct "knowledge" of the details of the sensory input. And a supervisor may, from the inside, adjust both the goal for the comparator's initiating a reaction and the organizer's subsequent behavior. In this case, the organizer contains selectable subroutines for different actions. Which one is chosen, under given circumstances, depends on the supervisor's decision.

Of course, such an information system containing these six elements could also be modeled in a computer. But in this case the supervisor's selection options, together with their conditions for activation, would have to be pre-specified—again corresponding to a genetically fixed system. A robot or a computer will never be conscious, although it is perfectly capable of modeling even complex information systems. Apparently, a robotic system would not be flexible enough for the behavior needed by higher animals, and so reducibility of psychology to the body is not proven.

We get the impression that higher animals, like we, have a certain freedom of choice. Apparently, emotions sensibly dealing with hunger, fear, sexual drive, and so on imply some consciousness. The resolution of conflicts between impulses like hunger and fear would, in some situations, require adaptability and a choice. Through their internal supervisor, animals might choose different behavioral subroutines under different environmental conditions, with sufficient leeway to allow for learning or even sometimes arbitrary decisions.

These psychological functions could be called "soul." The animals created in Gen.1:20 are described in a way that suggests "higher" life forms.²⁴ They are called "living souls." They *are* souls, not bodies *having* a soul. This corresponds to contemporary trends in both neuropsychology and theology which usually reject a dualism separating body and soul. There is a difference between a dualism (or "trialism"), sometimes postulated in theological discourse to make room for soul and/or spirit, and the different dimensions I suggest. Body and soul considered dualistically are different interacting entities, but different dimensions are aspects of the same unitary entities.

Some psychological functions have been localized to certain brain regions. Apparently, brain states correspond to psychological states. The soul is embodied in the brain. That does not mean it is *caused* by it. Calling the soul an "emergent property" of the brain, reducible to brain activity, begs the question.

In addition, humans have self-consciousness, as distinct from purely emotional or sentient consciousness. Self-consciousness is impossible to ascertain in animals, even apes.²⁵ Our psychological regulatory system, containing instances of circuits consisting of the six logical elements mentioned, seems to be embedded in a still higher, spiritual one, defined by the "image of God." If it could be modeled like the lower informational systems discussed, it would need at least one additional logical element, (7) a *meta-supervisor*. The image of God provides us with personality, explicitness,²⁶ conscience, freedom of choice and responsibility, spiritual goals and behavior, and the possibility of dialog with God. Symbolic language and abstract reasoning probably also belong to this human-specific set of faculties.

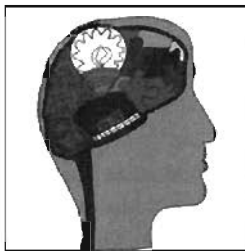
Body and soul considered dualistically are different interacting entities, but different dimensions are aspects of the same unitary entities.

To summarize, the behavioral repertory of lower animals consists of genetically programmed execution of pre-specified reactions—biological functions. That of higher animals includes instinctive, emotional selection between different actions—psychological functions. That of humans, in addition, allows self-conscious, free, responsible decisions based on conscience—spiritual functions.

According to this model, the human being is three-dimensional, body-soul-spirit,²⁷ but still a unitary, indivisible person. Spiritual functions have psychological correlates, and these have correlates in biochemical structures, configurations, and activities in the brain. But no reductionism of spirit to soul and soul to body is implied. Such reductionism fails to provide sufficient causes for the effects observed. And it contradicts our personal experience of being self-conscious, responsible, free agents.²⁸ A simple analogy for this nonreducibility may be the fact that we communicate nonmaterial ideas, yet their transmission uses physical substrates, such as paper and ink, sound or light waves. Clearly, ideas are not products of storage or transmission media.

Creation of Dimensions and of Individuals

God uses diverse modes of creation. I am not setting these modes in parallel to the different dimensions found in created entities. All of God's modes may be applied to all of the created dimen-



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sions. The two sets are "orthogonal," the Creator transcending all aspects of creation. All that is required by my model is that the dimensionality of any of God's modes of action transcends the dimensionality of the entity created or operated on.

In Genesis 1, the verb "to create" is used three times: for the universe, higher animals, and humanity.²⁹ This may be correlated to the physical, the sentient (or psychological), and the spiritual dimensions. In each case, something fundamentally new originated, that did not exist before.

Between these special events, and persisting through the second and third of these, there was a continuous history of development. Of course, this natural development or evolution is just as much God's doing as the special creative acts explicitly declared as such. These other events or processes in Genesis 1 are described by terms such as "God made" or "the earth brought forth," indicating God's mediate action using materials, objects, and processes already in existence. For such mediate divine action, theology uses the term "providence," while science considers these processes to be "natural" or "law-like." God's commands "let there be ..." do not, by themselves, imply instant creation out of nothing. They do not indicate by what mode or mechanism the entities were to be produced. They are just declarations of what God wanted to happen.³⁰

But creation by God is not restricted to these dimensional origins. Each human individual, as well, is created, as Isa. 43:7 indicates: "... every one who is called by my name, whom I created for my glory, whom I formed and made." Each person grows out of a natural conception. In this developmental process, God is creating (*bara'*, as in Gen. 1:27), forming (*jatzar*, as in Jer. 1:5; Gen. 2:7) and making (*asah*, as in Gen. 1:26). But in what sense does he *create*, if the process is natural? A natural process is determined by natural law, with some stochastic variation. Do some aspects of an individual's origin leave open the possibility that supernatural, but scientifically undetectable events might be involved?

The parameter space involved, in which the formational processes of individual conception and development occur, is transastronomically huge: only about 270 binary selections among alternatives suffice to pro-

duce a transastronomical number of different combinations.³¹ That such high multiplicity of possibilities applies to development is indicated by the many biochemical events which result in random outcomes, in scientific parlance. Mutations, selection of genes inherited from mother or father, genetic recombinations, details of the spatial configuration of the neural network and synapse formation are largely random. The particular outcome of each of these events is presumably the consequence of some elementary or quantum event or events bifurcating (or multifurcating) between almost equally probable possibilities. As quantum events are not deterministic, the final biological results of these developmental processes cannot be predicted. Science can only treat them as genuinely random.

Therefore the Creator's activity may reasonably be modeled as guiding natural development in the physical, sentient, and spiritual realms, using many hidden supernatural selections among equally possible elementary events.³² I am not claiming that this must necessarily be the case, just that it is a logical possibility of God guiding the process in detail, without science being able to detect such "interference." The term "create" implies the origin of a novel person—defined by such selections. Such an understanding of God creating a novel entity or reality by performing quantum selections may be generally applicable to any aspect of formative natural processes, e.g., in evolution.

If God would refrain from affecting the formation of an individual, the various biblical indications³³ pointing to a divine action leading to specific human individuals' constitutions would be incomprehensible. I take my notion of God using such hidden options as being supported scientifically by the transastronomical probability spaces of elementary events, most of which would produce system failure, and theologically by the explicit biblical indications of God's being active in the whole process.³⁴

The term "spiritual" may refer to either the human spirit or God's Spirit. This may cause some ambiguities, which I try to clarify by the following suggestion. God's image has been given to *all* humans. That makes them spiritual in the sense of the human spirit, namely real humans, or persons responsible to God for their decisions. But

only *some* accept God's offer of salvation, receiving the new, eternal life—a fourth dimension, beyond body, soul, and (human) spirit. Those trusting in God's promises are saved by Christ, becoming spiritual in the sense of God's Spirit, by being born again—a new creation.³⁵ This also applies to Old Testament believers like Abraham.³⁶ Maybe Isa. 43:7 also distinguishes the gifts of the human spirit ("whom I created for my glory") and of God's Spirit to a human becoming a child of God ("who is called by my name").

Thus, God operates directly ("creating") and indirectly ("making") throughout all of creation, not only initially, but continuously. He operates through natural processes. We recognize these as non-unique, repeatable events. We speak of God's providence. But he also operates in unique events. There he applies creative choices. We speak of his creative activity. Both modes pervade all of reality, from the cosmos through macro events to elementary quantum events.

The unique, nonrepeatable mode of creative choices applies to the origin of the cosmos, the selection of natural laws, fundamental parameters and cosmological fine-tuning, to miracles (or signs) in the macro realm, and—as I am suggesting here—to the selection of some, probably many, quantum events. The repeatable, providential mode of natural processes applies to the continued existence of the cosmos, natural laws and fundamental parameters, their regularity, deterministic macro events and stochasticity, as well as truly random (unselected) quantum events.

Of course, science cannot distinguish between unique and normal quantum events—for science, all are random. And it must be mute about all other unique events as nonrepeatable. Persisting consequences of unique events, of course, remain subject to scientific investigation—such as those of the big bang and other "historical" events.

Randomness and Its Implications

If God occasionally uses selection of specific outcomes in quantum and other random events, in order to guide natural processes in a desired direction, such interventions remain hidden from scientific investigation. Therefore all occurrences of randomness mark areas where God's hidden options are possible, e.g., in the evolution of novel biological functionalities and in the constitution of human individuals.

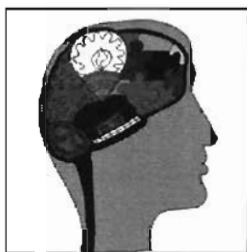
It is essential to understand what randomness, in a scientific sense, implies. In everyday parlance, "random" and "chance" are often taken to exclude meaning, purpose, design, or even human and divine freedom of choice. In science, "randomness" has a restricted but specific meaning. In some contexts, science is, in principle or practice, incapable of predicting the specific outcomes of individual events. There, it considers an entire set of them as a whole, dealing with this set by means of stochastic mathematical

methods. In this paper, I am using "randomness" in the scientific sense exclusively.

Even deterministic processes may produce a huge number of different possible outcomes, as seen in deterministic chaos.³⁷ Chaos is possible when there are nonlinear processes, e.g., growth processes, which of course are ubiquitous in biology. To this, we have to add the effects of quantum uncertainties and other stochastic processes. Thus, the number of possible outcomes is often infinite, for all practical purposes. This means that we find random processes and randomness everywhere in creation. And wherever there is randomness, science cannot distinguish between truly random events, providentially decreed as such by God, and specific events, selected by his creative choices.³⁸ Of course, God's creative options include both the decision about whether to direct a given quantum event (or leave it genuinely random) and the decision about its result.³⁹ God's hidden options are limitless.

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In particular, randomness, with possible divine guidance, also applies to biological systems. Randomness is found in the evolution of a species, as well as in the development (and the personal history) of each individual. For instance, there are aspects of randomness in brain structure.⁴⁰ Neurons and their dendrites grow during development into configurations which apparently are partly random. Then, in adults, the configuration may remain largely fixed. It belongs to the constitution of the individual. But the dendrites sprout spines, which form synapses, connecting to other neurons. The spines grow and disappear throughout life on various time scales.⁴¹ There may be randomness in synapse formation, but selection in their maintenance, by reinforcement of the circuits actually used. The stable synapses may reflect learning, memory, decisions, and so on. There are about 10^{10} neurons with



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a total of about 10^{14} spines in a human brain, resulting in a transastronomical number of possible configurations. Although this fine-structural architecture looks largely random to scientific investigation, much of it may be the result of hidden divine creative choices—as well as free-will decisions of the individual.

Randomness is also found in evolutionary processes, driven by natural selection of random mutations. Some proteins, which are essential for the survival of the organism, change very little during the course of evolution. Others change more rapidly, even virtually at random, in some portions which contribute little to their functions (neutral evolution). In spite of the relative constancy of conservative protein sequences, they usually differ in different species. Substitutions in conservative proteins start out as random mutations, but are expected to have consequences for the species fixing them. Thus, even in the most slowly evolving molecules, whose sequences are severely constrained by functional requirements, randomness plays an important role.

With slowly evolving proteins, phylogenies spanning hundreds of millions of years of evolution can be computed. In order to improve the signal-to-noise ratio for phylogenetic analysis, sequences are sometimes concatenated. In one example, a phylogeny of forty-five species of all three domains of life was derived from the alignment of twenty-three concatenated conservative proteins with a total of 6,600 amino acids.⁴² The path from the universal root to humans involved 1,900 consecutive amino acid substitutions, or one in every three to four amino acids (this is a minimum estimate, as there may have been reversals). For the short-lived prokaryotes, such as bacteria, there were even many more amino acid changes, e.g., 4,414 in the case of *Haemophilus influenzae*. Yet, each consecutive substitution was the result of one of a transastronomical number of randomly possible mutations, since there are twenty possible amino acids at each of the 6,600 positions. And each of the adaptive mutants had to be selected and fixed in the population, which does not occur immediately.

With ribonucleic acids (RNA), the situation is similar. For an RNA phylogenetic

tree, one investigation aligned 1,574 nucleotides of the extremely conservative small subunit ribosomal RNAs of each of more than 2,500 eukaryotic species.⁴³ The human line has accumulated 389 substitutions since the eukaryotic ancestor, or one in every four nucleotides, at least. For nucleotides, there are fewer mutational choices than for amino acids, as there are only four different nucleotides, but still the total number of possible combinations is transastronomical, and each mutation is random before selection sets in.

How frequent are adaptive mutations which get fixed in a species? Are 3.8 billion years⁴⁴ enough to allow for one hundred or more sequential adaptive mutations in a highly conservative protein? Is it reasonable to assume that a sufficiently large part of all random mutations produce something useful for the organism? How does the evolutionary process work at the level of individual mutations?

The Mechanism of Evolution

The highly random character of the basic evolutionary mechanism makes spontaneous, unguided evolution very slow and inefficient. On the other hand, the biosphere is extremely complex and efficient. This suggests some divine guidance of quantum and other random events. Conversely, the possibility of God applying an extensive but hidden creative influence underlines the providential importance of the highly random structure of natural systems and processes.

To investigate molecular evolution in a particular bacterial enzyme, DNA polymerase I of *Thermus aquaticus*, its highly conserved active site, containing eight amino acids, and five adjacent positions were extensively mutagenized and then assayed *in vitro*.⁴⁵ All of the adjacent positions and half of the active site positions produced various mutants retaining some activity, even wildtype level. But among the naturally occurring DNA polymerases I, 80% have the standard active site. In seven of thirty-four prokaryotes, six natural variants were found (of 17 billion possible substitutions), yet all but one of them were different from any of the artificial ones.

This implies that in nature, selection weeds out even most of those mutants that

would be active *in vitro*. We do not know if *any* of them are truly synonymous with some wildtype actually found, that is, equally useful in the organismal and environmental context. In any case, only a very small fraction of the functional mutants are in fact found in real organisms. Why is this so? Apparently, real ecosystems in nature are much more restrictive than feasible laboratory experiments, making natural evolution correspondingly more difficult.

A single mutational step seems to be a rather simple event. In fact, this is not the case. J. Felsenstein did some calculations of microevolutionary dynamics on the basis of what he considered the most probable estimates for the relevant parameters.⁴⁶ The huge majority of new mutations are deleterious. Even most of the slightly beneficial ones are lost to genetic drift, especially in large populations. Very few of the adaptive ones may go to fixation in the population. As a result, the substitution rate is an extremely small fraction of the mutation rate, probably less than one in 10 million. It is virtually independent of the mutant's fitness, as fitter mutants occur much less frequently. In fact, the vast majority of successfully fixed mutants have a very small selection coefficient, yielding at best a minute improvement.

Thus, the Darwinian mechanism of random mutation and natural selection is extremely inefficient and slow, even for just improving already existing functionalities. In accordance with this estimate, most of the new genes are apparently derived from pre-existing ones by means of minor modifications or domain shuffling by genetic recombination. It is still very much an open question how really novel domains and functionalities arise.⁴⁷ Does this require some guidance — by divine hidden options?

Biological Information— Emerging or Designed?

The Creator has an infinity of options for ways of influencing and guiding the natural processes of species evolution and individual development, without science being able to detect any of it. This might solve the problem of the origin of novel biological functionality and of meaningful personal individuality. As such divine influence need not be absolute, but the right dose may be given according to God's design in each case, human free will and theodicy (the question of God's justice) need not be problematic, either. Any creaturely freedom translates into a corresponding responsibility.

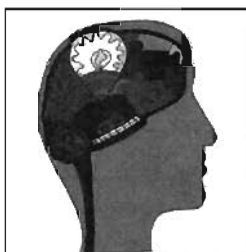
Random mutations and natural selection may suffice for bringing about some improvements of already existing functions. Yet, each of these mutation-selection steps provides for at most one bit of information — in the form of a yes/no answer — being transferred from the environment to the species in which the mutation is eventually fixed. This mechanism may be too slow for producing novel

functions by random walks within the times indicated by the fossil record, not to speak of generating entire viable organisms in the first place.

Long paths of sequential random events characterize both phylogenetic evolution and ontogenetic development. These paths comprise many bifurcations between alternatives of virtually equal probabilities. These may be points of divine selection, hidden from possible scientific investigation, but of momentous significance for the species or individual involved. This may occur even in normal, "simple" evolutionary improvements of function. Without overriding any natural process, God may guide in detail the evolutionary paths of species, as well as the development of the bodily, psychological, and spiritual constitution of every individual. Each selection represents some hidden feeding-in of formative information into the system.⁴⁸

In the case of a new individual, a novel personality requires a potentially huge number of such selections contributing to the final constitution. This divine guidance, invisible to science, would represent the fundamental novelty implied by "creating."

For each adaptive mutation successfully fixed, there are, in principle, two possibilities. In the first case — the only one accessible to science — the mutation is truly random (God's providence at the quantum level), the probability of selection is extremely low, the time to fixation extremely long, successful fixation very improbable, and the increase of information is due entirely to selection by the environment. In the other case, the particular mutation is determined by God's selective choice (quantum event guided by God), selection and fixation occur according to God's predetermined schedule (maybe through other guided quantum events), success is certain, and God's guidance is the source of the information increase. In both cases, scientists rightly see such events as random. In principle, the first case is repeatable and could be shown to be randomly dispersed. The second case is unique, and so its repeatability cannot be investigated. On the other hand, both cases are the outcome of God's design, either providential or creative. In the case of a new individual, a novel



The origin of the spiritual dimension (God's image) introduced the possibility of free-will decisions inherent in a responsible personality and a corresponding amount of independence from psychosomatic factors. This freedom is a foundational characteristic of the love relationship God desires to establish with humans ...

Article

Dimensions of the Human Being and of Divine Action

personality requires a potentially huge number of such selections contributing to the final constitution. This divine guidance, invisible to science, would represent the fundamental novelty implied by "creating."⁴⁹

Would such an intimate and pervasive divine influence support determinism and negate the individual's personality and free will? This would be a misunderstanding. Not even a fully deterministic influence of natural genetic and environmental factors on the individual's constitution and development could have this effect. The origin of the spiritual dimension (God's image) introduced the possibility of free-will decisions inherent in a responsible personality and a corresponding amount of independence from psychosomatic factors. This freedom is a foundational characteristic of the love relationship God desires to establish with humans, so we may confidently assume that he observes this objective in his creative guidance work. We are ignorant as to how this is done, but there will be an intimate interaction between God's providential or creative action and the individual human's free-will decisions throughout life, superimposed on any "natural" factors.

Similar considerations will apply at a higher level for the spiritual lives of the ones called and born again on the basis of their faith. They are both under the influence of the indwelling Holy Spirit and their own free-will decisions.

God has plenty of options to providentially and creatively direct (or override if necessary) both natural events and actions of personal free-will creatures, even without in any way overpowering natural causal connections or free will.⁵⁰ This is both hinted at by the testimony of Scripture,⁵¹ and allowed for by creation's quantum indeterminacy. It might provide a plausible solution—although not a scientific one—to some of the still perplexing mysteries of biological and, in particular, human complexity. ♦

Acknowledgment

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Notes

¹A previous, shorter version of this paper was presented at the Annual Meeting of the American Scientific Affiliation, Colorado Christian University, Lakewood, CO (July 25–28, 2003).

²Gen. 1:27.

³S. J. Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine, 1999) coined the term "Non-Overlapping Magisteria" for this idea; S. N. Haq, "Thou Shalt Not Mix Religion and Science," *Nature* 400 (1999): 830–1; and A. J. L. Menuge, "Interpreting the Book of Nature," *Perspectives on Science and Christian Faith* 55 (2003): 88–98.

⁴R. Hooykaas, *Religion and the Rise of Modern Science* (Edinburgh: Scottish Academic Press, 1973); H. P. Nebelsick, *Renaissance and Reformation and the Rise of Science* (Edinburgh: T & T Clark, 1992); I. Hutchinson, "Science: Christian and Natural," *Perspectives on Science and Christian Faith* 55 (2003): 72–9; and A. J. L. Menuge, "Interpreting the Book of Nature."

⁵In the biblical texts, such "natural" data are phrased in an "anthropomorphic" language (the way something looks to an ancient observer). Exegesis has to take this into consideration.

⁶A. Held and P. Rüst, "Genesis Reconsidered," *Perspectives on Science and Christian Faith* 51 (1999): 231–43, www.asa3.org/ASA/PSCF/1999/PSCF12-99Held.html.

⁷Gen. 1:26–27.

⁸Ps. 102:18; Isa. 43:1, 7, 15; Ezek. 21:30; 28:13, 15, Mal. 2:10. He even creates individual animals: Ps. 104:30.

⁹The emergence of biological life from nonliving matter requires so much semantic or functional information that it is extremely unlikely to have been produced spontaneously. See P. Rüst, "How Has Life and its Diversity Been Produced," *Perspectives on Science and Christian Faith* 44 (1992): 80–94, www.asa3.org/ASA/PSCF/1992/PSCF6-92Rust.html.

¹⁰Gen. 1:20, 21, 24, 30.

¹¹Gen. 1:27.

¹²John 1:12; 3:3–7; 2 Cor. 5:17.

¹³M. Bekoff and P. W. Sherman, "Reflections on Animal Selves," *Trends in Ecology and Evolution* 19 (2004): 176–80.

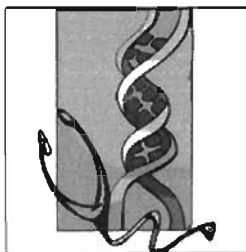
¹⁴Held and Rüst, "Genesis Reconsidered."

¹⁵Ibid.

¹⁶T. I. Bonner, C. O'Connell, and M. Cohen, "Cloned Endogenous Retroviral Sequences from Human DNA," *Proceedings of the National Academy of Sciences USA* 79 (1982): 4709–13; W. E. Johnson and J. M. Coffin, "Constructing Primate Phylogenies from Ancient Retrovirus Sequences," *Proceedings of the National Academy of Sciences USA* 96 (1999): 10254–60; J. F. Hughes and J. M. Coffin, "Evidence for Genomic Rearrangements Mediated by Human Endogenous Retroviruses During Primate Evolution," *Nature Genetics* 29 (2001): 487–9; and E. E. Max, "Plagiarized Errors and Molecular Genetics. Another Argument in the Evolution-Creation Controversy," www.talkorigins.org/faqs/molgen/ (2002), updating of an article in *Creation/Evolution* XIX (1986): 34.

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- ²⁰P. Rüst, "Creative Providence in Biology," *Perspectives on Science and Christian Faith* 53 (2001): 179–83, www.asa3.org/ASA/PSCF/2001/PSCF9-01Ruest.html. The claim that artificial *in vitro* selection of ribozymes, starting with random sequence mixtures, proves this point ignores the wildly different numerical parameters characterizing natural protein evolution in the biosphere.
- ²¹A working definition of what constitutes a "higher" animal, from both a biological and a biblical perspective, is given in Held and Rüst, "Genesis Reconsidered."
- ²²D. M. MacKay, *Behind the Eye* (Cambridge, MA: Basil Blackwell, 1991), 43.
- ²³*Ibid.*, 51.
- ²⁴Animals moving quickly and purposefully require a certain size, a blood (or hemolymph) circulation, a nervous system of a certain complexity, and probably a certain level of consciousness. Lower animals lacking this combination are never called "living" in the Bible. God speaking to the "living souls" and blessing them appears to imply some consciousness, and "life" is closely connected with "blood" (Gen. 9:4; Lev. 17:11–14).
- ²⁵R. Tallis, *The Explicit Animal: A Defense of Human Consciousness*, 2d ed. (New York: St. Martin's Press, 1999).
- ²⁶*Ibid.*
- ²⁷1 Thess. 5:23 may hint at such a three-dimensionality.
- ²⁸MacKay, *Behind the Eye*, 238 ff.
- ²⁹Gen. 1:1, 21, 27.
- ³⁰Ps. 33:9 is sometimes erroneously claimed to prove that every divine declaration of intent is followed by its immediate and miraculous fulfillment. As many prophecies pertaining to the distant future show, this is not always the case.
- ³¹ $2^{270} = 1.9 \times 10^{81}$.
- ³²P. Rüst, "Creative Providence in Biology"; —, "God's Sovereignty in Creation – A Reply to Howard Van Till," *Perspectives on Science and Christian Faith* 54 (2002): 216–7.
- ³³Not only the statements using "bara" (like Isa. 43:7) are relevant here, but many others, too, e.g., Ps. 139:13 ff.
- ³⁴I have argued before that Van Till's notion of a "robust formational economy principle" is unlikely to apply to the biosphere, not for theological, but for scientific reasons. See P. Rüst, "Creative Providence in Biology"; and —, "God's Sovereignty in Creation – A Reply to Howard Van Till."
- ³⁵John 1:12; 3:3–7; 2 Cor. 5:17.
- ³⁶John 8:56.
- ³⁷G. P. Williams, *Chaos Theory Tamed* (Washington, DC: Joseph Henry, 1997), 230, shows a computer graphics presentation of the attractor of the chaotic domain of the logistic equation generated by S. Kuzminsky.
- ³⁸That God may guide apparently random events is indicated, e.g., in Prov. 16:33.
- ³⁹God's "interference" may even represent a specific probability density function modifying the natural stochastic one.
- ⁴⁰D. M. MacKay, *Behind the Eye* p. 20, shows a typical sample of intercell connections in the cerebral cortex.
- ⁴¹O. P. Ottersen and P. J. Helm, "How Hardwired Is the Brain?" *Nature* 420 (2002): 751–2.
- ⁴²J. R. Brown, C. J. Douady, M. J. Italia, W. E. Marshall and M. J. Stanhope, "Universal Trees Based on Large Combined Protein Sequence Data Sets," *Nature Genetics* 28 (2001): 281–5.
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- ⁴⁴H. D. Holland, "Evidence for Life on Earth More Than 3850 Million Years Ago," *Science* 275 (1997): 38–9.
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- ⁴⁶J. Felsenstein, "Taking Variation of Evolutionary Rates Between Sites into Account in Inferring Phylogenies," *Journal of Molecular Evolution* 53 (2001): 447–55.
- ⁴⁷J. Zhang, "Evolution by Gene Duplication: An Update," *Trends in Ecology & Evolution* 18 (2003): 292–8.
- ⁴⁸But if a selection is hidden, science has no way of knowing whether it was required for functionality, or whether an alternative route could have led to a functionally synonymous protein. This implies that it may be impossible to meaningfully define the true amount of functional information contained in a biological system.
- ⁴⁹Perhaps this concept of divine micro-guidance could be applied to the cosmological fine-tuning required to prepare a planet inhabitable by intelligent beings, cf. H. Ross, *Big Bang Refined by Fire* (Pasadena, CA: Reasons to Believe, 1998), 13. Although observational searches for other habitable planets have failed so far (of over one hundred found, none is habitable, cf. J. J. Lissauer, "Extrasolar Planets," *Nature* 419 [2002]: 355–8), the estimates of the probability of formation of such planets are still rather poorly constrained, cf. S. Franck, A. Block, W. von Bloh, C. Bounama, I. Garrido, and H. J. Schellnhuber, "Planetary Habitability: Is Earth Commonplace in the Milky Way?" *Naturwissenschaften* 88 (2001): 416–26.
- ⁵⁰The existence of angels – personal, responsible, superhuman spiritual powers – some of which are in rebellion against God, may provide a solution to the theodicy question with respect to natural evils.
- ⁵¹Gen. 50:20; John 19:30; Luke 24:26.



Article

Genetic Prospects: Finding a Balance between Choice and Acceptance

Genetic Prospects: Finding a Balance between Choice and Acceptance

D. Gareth Jones



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Advances within genetics would be of little more than theoretical interest if they did not present the human community with novel choices. The tensions rampant in the genetic area stem from the nature of these choices, and from a refusal to accept the legitimacy of the underlying medical conditions. Since this situation is made possible by scientific advances, it is sometimes interpreted as demonstrating the inexorable advance of human control into what was once seen as God's domain. If this interpretation is correct, the genetic arena is rightly viewed as the new battleground between science and religion. In order to assess the validity of such an interpretation, genetic advances are considered in a therapeutic context, placing emphasis upon humility rather than hubris. An attempt is made to find a balanced approach to an understanding of genetic knowledge, especially taking into account environmental factors. The necessity of making choices is interpreted from the perspective of ordinary people having to make exceedingly difficult choices for their families. Since many choices in the genetic area involve choosing for or against embryos, the place of embryos within the context of the other parties frequently involved in genetic decision-making is explored.

Should

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The prospects opened up by developments within the genetic arena revolve largely around the extent to which we are prepared to grapple with the choices they present to us. While attention usually focuses on the nature of these choices, the preliminary step of deciding whether choice itself is appropriate is often ignored. Should the prospects opened up by genetic advances be welcomed or should we accept the genes with which we and others are endowed (what is sometimes referred to as the genetic lottery)? This tension between choice and acceptance is multifaceted, and includes within its dimensions a theological component. Should Christians welcome the possibility of genetic choice or is it to be regarded as a challenge to God's overall control?

The question of genetic choice is neither a theoretical one nor a future one. It is a profoundly practical one, so much so that it leads to the fear that science is omnipotent, and that the flow of biomedical technological developments is inexorable. One may even ask whether discussions of ethics, let alone theology, are irrelevant. Has the battle for the human soul already been lost, and are we hurtling toward a posthuman, technologically-driven future, with the propensity to subvert human values by creating separate classes of enhanced and unenhanced human beings.¹

Fears of this ilk dominate many discussions of genetics, leading to the conclusion that genetic choice should be eliminated if we are to avoid a biological Armageddon. Our task should be that of arguing against genetic manipulation, and of maintaining the fabric of the human body in the form in which we know it today. And yet such a stance, if interpreted simplistically, leads to the complementary stance, that of acceptance of whatever genetic conditions emerge.

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The fabric of the human body incorporates genetic variables leading to disastrous disease states that have traditionally been coped with according to the capabilities of the medical knowledge of the day. Are we now to dispense with this tradition by ignoring the prospects opened up by genetic-based approaches?

The crux of this issue lies in the nature of genetic choice itself. If it is regarded as novel, the assumption is being made that this sort of choice only emerged with the rise of modern genetics. I shall argue that it is far from novel since it is embedded within modern medical practice. In arguing my case, I shall trace what I regard as a continuum from medical treatment and genetic control at one end, through to what some interpret as genetic predestination at the other.

A Continuum from the Known to the Unknown

This continuum can be illustrated by tracing its stages from conventional treatment at one end through to the other end with its overtones of science fiction.²

Conventional Medical Practice

Medicine A is found to cure disease A'. It is not known how medicine A works, but it does. The patient recovers from disease A', and no major problems are raised by anyone. Medicine B is effective in controlling and even curing disease B'. The way in which this medicine works is known, and this knowledge is important in determining who will and who will not benefit from its use. Medicine C cures disease C', and in this instance the medicine is genetically-based and acts on a particular gene. The medicine modifies the protein causing the disease, since it acts by targeting this gene.

Though there is a considerable distance scientifically between medicine A and medicine C, the effectiveness of all three medicines means that the outcome for the patient is similar in all three cases. In view of this, it is unlikely that we will encounter any ethical or theological issues. Medicine C with its genetic rationale is no more problematic than medicine B, which in turn is no more problematic than medicine A. The degree of control and the sophistication of the technology have changed markedly in the move from A to C. In parallel with this, the efficiency and the effectiveness of the approaches have also changed. However, the control being exerted, even with C, is far from complete.

It is difficult to see how the integrity of the human person could in any way be threatened by any of these treatment regimes. In each instance, the central consideration is whether the treatment will benefit the patient. If medicine C, the genetically-based medicine, assists the patient, whereas medicine A, the far more traditional and

relatively ineffective approach, does not, use of medicine C is preferable to use of medicine A. Under these circumstances, the role of genetics ethically and theologically is of subsidiary importance.

Sophisticated Genetic Control

In a future world, it is possible to envisage far more precise forms of genetic control. The first of these introduces us to a patient with Alzheimer's disease (AD), when the protein deposition largely responsible for the symptoms of the disease can be prevented by genetic means. The result is that very early cases of the disease can be prevented from developing further. This would be an excellent example of gene therapy.

We should not dismiss out-of-hand means (including genetic means) of remedying major defects.

The second hypothetical "patient" is an embryo, which is known to have a (set of) gene responsible for some forms of AD. This embryo has a vastly increased chance of developing AD by the age of sixty years. In this imaginary world, gene therapy has reached a stage where this AD-causing gene can be replaced by a normal gene, without giving rise to deleterious side-effects. As a result, the likelihood that this future individual will suffer from AD can be decreased markedly. In another very similar scenario, genetic manipulation of an embryo could hypothetically be employed to decrease the likelihood of an affected individual developing heart disease at fifty years of age. Both are examples of very sophisticated gene therapy that borders on genetic enhancement.

The third "patient" is also an embryo; the future individual will suffer from mental retardation. Let us imagine that it were to prove possible to genetically manipulate the embryo to produce an individual with "normal" mental abilities. Such an individual would be radically different from early infancy onward, and would truly have been enhanced. The contrast between the unaltered (non-manipulated) and the altered (manipulated) states would be dramatic, in that the two "people" may be practically unrecognizable as potentially the same individual.

These possibilities are not put forward as justification for contemplating moving in any of these directions. All I am contending is that, in the same way as normal brain function is preferable to epileptic fits, or normal eyesight



Article

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Consequently,
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is preferable to myopia or glaucoma, we should not dismiss out-of-hand means (including genetic means) of remedying major defects.

Genetic Foreknowledge

In an even more futuristic setting, it is possible to envisage a world where the genetic make-up of individuals is totally known and, hence, is open to being analyzed by others. Genetic "chips" are available, and these could be used to read out our individual genetic make-up. Theoretically, everything that could be known about us genetically is open to scrutiny. Information is available about the functioning of our kidneys or brain, the chances of our manifesting a whole range of cancers or heart disease, and even our ability to cope with stress, or our proneness to depression. This is where the human genome project may lead, presenting as it does enticing therapeutic vistas, or alternatively, dire predictions of abusive control and a loss of human freedom. Of those two paths, it is the negative one that is so often highlighted.

Genetic knowledge of this order could enhance people's understanding of themselves and their world. For instance, instead of having to think vaguely about, say, cholesterol levels, which may or may not have the significance attributed to them for particular individuals, people would theoretically have a far more precise means of knowing whether these levels should be taken seriously in individual cases. Whether people could cope with such detailed information is another matter, since the medicalization of life may become overbearing.

However, even in a world characterized by this level of genetic foreknowledge, there would still be an intimate connection between people's genes and the numerous environmental factors to have influenced genetic expression since the first few days of embryonic existence. A strong predisposition to develop stomach cancer is affected by dietary, neuroendocrine, external environmental, and attitudinal factors. It is a person, and not a set of genes, who develops stomach cancer. In other words, even in some future world of genetic foreknowledge, the crucial context will still be that of people in their wholeness, and not genes in some asep- tic, depersonalized cellular compartments.

Nevertheless, this discussion raises an even more fundamental notion, namely, that we can be "known" biologically ("known" genetically). For some, this is the ultimate in genetic determinism. This is an unfortunate conclusion, because the accuracy of the predictions will depend on factors additional to, and interacting with, the genetic. Just as genes contribute to what we are as people, the persons we have become influence the expression of our genes. Consequently, determinism is far less of a threat than once supposed, and reductionism should be regarded solely as a methodological tool.

Coming to Terms with Genetic Analysis

Reflection on these scenarios highlights a number of interrelated principles.³

- The context of these illustrations is that of medical treatment, and this will continue to be the dominant context in most situations. The significance of this context is that it serves to control and limit scientific bravado. While it does not provide an infallible framework, it differs significantly from that in which the ultimate goal is the creation of a race of supermen and superwomen. This is the contrast between therapy and hubris, and it serves as a reminder that genetic ventures occur in both contexts and not solely in the latter.
- A therapeutic context is a reminder that the welfare of individuals is paramount. If ever this is lost, a framework for person-centered decision-making is also lost. At a broader level, community-centered decision-making is crucial. In other words, these contexts are reminders that genetic therapy and modification are to be used to serve and assist people in need. To ignore the welfare of the needy and downcast, and use genetic interventions to serve the aspirations of those wanting perfect children or idealized offspring, is to misconstrue the science and misappropriate a therapeutic context.
- A continuum exists from unremarkable therapy through to startling new vistas: from genetic-based medicines, to the ability to determine individuals' future characteristics, and ultimately to the precision of an all-embracing genetic knowledge of our biological essence. Failure to acknowl-

edge this continuum in order to concentrate solely on the power to manipulate people is deeply troubling. Those who are fearful will oppose all forms of genetic science; those who are filled with bravado will seek to use the power of genetic science for self-aggrandizement. Recognition of the continuum provides a productive middle way.

- Science is not omnipotent; and even the degree of understanding and control I have hypothesized is unrealistic. All human control and all human expertise are severely limited, limitations that stem from both a mixture of human finiteness and human sinfulness. It would be a tragedy if our assessment of genetic science became warped by false illusions of scientific power. A backlash against such arrogance could lead to rejection of any use of genetics therapeutically. This, in turn, may cause us to turn our backs on abilities made available to us by God.
- Genetics in isolation provides a limited understanding of what constitutes the human person. It has to be seen alongside the environment within which individuals develop and function. It is this interaction between genetic and environmental factors that is basic to everything we are as people. This in no way invalidates the significance of genetics, but it does serve to place it within a broader biological context.
- The human person is always susceptible to manipulation, behaviorally, politically, pharmacologically and, in rare instances, genetically. There is no escape from this, because relationships with others are central to human existence, and these demonstrate the ease with which we abuse and exploit others for base ends. This emphasis on relationships stems from what we are as persons made in the image of a triune God. Relationships are central to the functioning of the godhead, and to every facet of human existence—biologically as well as spiritually.

From Hubris to Humility

The world of genetics can be intensely misleading, since it lends itself to oversimplification. Images of “designer babies,” the rampant cloning of famous and infamous individuals, and the engineering of our very essence through outlandish genetic manipulation serve to mislead theologically as well as scientifically. So does talk of technoeugenics, the segregation of what some writers refer to as “GenRich” individuals from mere “Naturals,” re-designing the human species, the emergence of genism, and the creation of posthumans.⁴ Such images fire the imagination, but do nothing for serious debate and analysis.

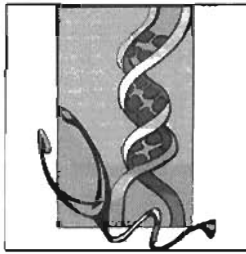
Discussion of topics like choosing our children’s genes tends to revolve around choosing genes for fair hair, blue eyes, intelligence, physique, good looks, avoiding baldness, or whatever. The ephemeral nature of these longings

only serves to demonstrate their superficiality, let alone the scientific precision, clinical complexities, and expensive resources that would be required to achieve them. Unfortunately, instead of demythologizing such fantasies as empty claims, they are taken seriously and are used to construct tirades against realistic and therapeutically based genetic choice. The latter can then be dismissed on the ground that its goal is that of producing perfect babies, designed to order. These twin themes of perfectibility and designer babies carry powerful negative theological overtones, with their message that science is assuming redemptive powers; salvation can be found in biological manipulation, and the hope of a better life emanates from genetic intervention.⁵

The Christian task should be that of debunking [the twin themes of perfectibility and designer babies, with their message that science is assuming redemptive powers], and not use it to frighten and mislead the faithful.

Christians rightly reject any such paradigms grounded in such quasi-scientific aspirations.⁶ The trouble is that these paradigms are based on little more than irresponsible journalistic hype (sometimes aided and abetted by scientists who should know better). The Christian task should be that of debunking this fatuous mythology, and not use it to frighten and mislead the faithful. To use it as the foundation on which to construct a case against genetic intervention in the name of Christ, is to fall into the same trap as those who look for a biological version of the new heavens and new earth. While the intentions of these two groups are radically different, they both accept the hubris implicit within a scientific vision that assumes that nothing lies outside its manipulatory abilities. Whether these are welcomed or rejected, they are real.

Starting from a baseline like this, any assessment (Christian or otherwise) of the prospects opened up by genetic intervention will be mired in opposition to them. The rationale of this opposition is rejection of hubris rather than an analysis of the prospects opened up by serious genetic science. Neither does it stem, of necessity, from the application of biblical principles, even acknowledging the problems encountered in their interpretation in a contemporary area like this one.



Article

Genetic Prospects: Finding a Balance between Choice and Acceptance

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The emphasis I wish to make is that the rejection of hubris (valid as it may be as a general principle) should not be the Christian's starting point. Far more relevant in this context is the embrace of humility—to enable a rigorous assessment of the merits of what can and cannot be accomplished by genetic science. Using the therapeutic framework I have previously advocated, our eyes then can be directed toward what can be realistically accomplished to benefit the patient.

The good of the patient becomes the guiding principle; embedded within this is a commitment to improve the quality of the patient's life or to replace illness by health. This is a positive hope, but it is also a realistic one. The genetic intervention may not work; our hopes may be dashed. But the attempt is to be encouraged as long as our expectations are guided by realistic clinical and scientific goals. There is no hint here of perfection or of ageless existence in a disease-free body. The dominant value is that of humility, demonstrated by caring for those in need, and of utilizing powerful technologies in the service of those potentially capable of benefitting from them.⁷ While it has to be acknowledged that the dividing line between therapy and enhancement is both unclear and shifting, an emphasis upon the good of the person helps to keep the focus on what is largely a therapeutic agenda.

Finding a Balance for Genetics

At a somewhat less journalistic level, reference is repeatedly made to gay genes,⁸ IQ genes,⁹ genes for aggression,¹⁰ and even smart mice. Regardless of which gene one is allegedly interested in, the basic message is the same—there are genes that cause us to act in certain ways. The underlying assumption is that there is a direct correlation between genes and disease, genes and behavior, or even genes and belief. It may even be that we can choose genes for our children, rendering them intelligent, bright, beautiful, and possibly even virtuous. The hope appears to be that we could ensure that they turned out to be compliant to our wishes, becoming entrepreneurs, scientists, or accountants, or excelling in chess, football or ballet. Perhaps we could increase the likelihood that they follow Christ. Take your pick; all that is required is that you choose the appropriate genes!

These are disturbing possibilities, since they undermine central elements within our responsibility as human beings. If, say, I have no choice but to be aggressive, I am unable to respond to the call of Christ to be a peacemaker and to love my neighbor as myself. It may even be that the fruits of the Spirit cannot manifest themselves in my life, not because I am being unfaithful, but because I am genetically inclined to be jealous, angry, and selfish. And what if my Christian journey amounted to nothing more than a genetic or neural predisposition?

These are unsettling vistas, since they presuppose that all we stand for can be explained in genetic terms, which is usually interpreted as explaining away everything we stand for. The mere description of a personal characteristic in scientific (whether genetic or neural) terms is taken as invalidating that characteristic. This, however, fails to understand the relationship between any complex human/personal characteristic and the genetic basis for some aspects of that characteristic.

The link between individual genes and behavior is far more complex than suggested by the "gene for X" scenario. This is because multiple interacting genetic factors usually contribute to a trait. Besides this, environmental factors are also of major relevance, with genetic and environmental factors interacting in a complex manner. Interestingly, genes are switched on and off in response to a variety of pressures, both during development and later on in cell life, while the proteins produced by genes may be subsequently modified themselves.¹¹

Consequently, a gene, or even set of genes, acting in isolation will rarely be the only cause of a particular condition. The pathway between a gene, a particular protein, and an individual scoring highly on an IQ test or having an aggressive personality, is very indirect. This is not to say that genes have no influence on behavior—they do, but concentration on genes to the exclusion of other factors grossly oversimplifies the human condition. The complexity of what we are as human beings is rivaled only by the complexity of our genetic (and environmental) make-up.¹²

The world of behavioral genetics points clearly to the conclusion that aspects of our

character and personal identity have a genetic basis. This is not surprising, since our bodies are integral to who we are as people. Genetic factors are inevitably involved, even at the deepest (some would say the most sacred) levels of what makes us the people we are. But this in no way threatens the conception of a person as a rational being, capable of taking responsibility for ourselves as free agents. Neither does it detract from our ability to act as God's agents and stewards in his created order.

It is unwise to attempt to see genes as isolated units. The relationship between them and a diversity of environmental influences is an intimately interlocked one.

We acknowledge that human beings have a limited freedom, one constrained by our biological and environmental circumstances and also by our genetic make-up. We are not perfectly free, but have we ever thought we are? Through this self-understanding we can begin to appreciate our moral and spiritual limits, as well as our addictions and predispositions. We may also begin to see how God's grace can renew what we are as people, including possibly the ways in which genes are expressed in our body systems.¹³

We are "of the earth," and we recognize that God himself was incarnated to become one with us: to become flesh, with (among many other things) its genetic building blocks. These building blocks, however, are far from unalterable, since the environment affects everything to which they give rise. Surprisingly, this includes the micro-environment at the level of cells and tissues, as well as the far more obvious external influences. Hence, it is unwise to attempt to see genes as isolated units. The relationship between them and a diversity of environmental influences is an intimately interlocked one.

What this means is that genes are chosen indirectly as well as directly. Advertently or inadvertently, they may be modified by the nature of the environment in which children grow up and function. People and their bodies do not exist in a social vacuum. A vast range of genetic and social factors will always exist alongside one another. Compare the quality of life of the following: (1) those with potentially excellent health but living in a malnourished

community where their efforts are devoted to mere survival; (2) those brought up in abusive homes and characterized by behavioral problems as adults; (3) those with cystic fibrosis or some other equally debilitating condition but brought up in loving and supportive homes and communities; and (4) in the future, those brought into the world by cloning or following genetic modification of some description but raised in a loving environment where they are cherished for all they represent as individuals in their own right.¹⁴

These illustrations point to different forms of control—social in (1) and (2), and biological in (3) and (4). The outcomes are not inevitable and depend as much upon social pressures as biological (including genetic) ones. What is of crucial significance is the ability to be oneself and to relate productively to others within the human community. Relationships such as these emanate from our personhood, as those made in the image of God. The manner in which humans are treated should always be viewed within the broader context provided by human relationships, and never simply within the much narrower framework of biological parameters. Any choices we make should be choices to benefit people, and not simply to enhance disconnected building blocks, whether genes, livers, or brains. The latter acquire importance when viewed as contributing to the relatedness and wholeness of individuals as persons.

Underlying the position I am outlining is a *person-centered model*, over against a reductionist machine-centered model. We make choices for ourselves and on behalf of others, because people have to make choices. Some of these choices will not raise any genetic or technological issues, and do not generally elicit vigorous ethical debate. Others will, such as when genetic choices are made at the earliest stages of children's existence—probably when they are or were embryos. The thrust of my argument is that nongenetic and genetic choices should be viewed within a unitary framework.

But Should We Be Choosing at All?

From a Christian standpoint we are made in God's image, and so are to function like God. No matter how much our God-likeness has been shattered by sin and rebellion against God, we are still images of our maker, albeit tarnished images. As such we demonstrate a great deal of his creativity and his inquisitiveness. From this it follows that we are to exercise responsible control over the created order. Scientists are functioning as God's images, probing and thrusting into the created world, attempting to understand it, and then re-direct it as his stewards. Within the medical sphere, the desire is to exercise at least limited control over evil in the form of disease that would ravish and destroy all that is beautiful and worthy in God's world.¹⁵



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Article

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This, of course, is just one side of the picture. The other side is that scientists may be arrogant and unworthy, with motives of self-aggrandizement and personal glory. It is fear of such motives that leads to condemnation of science and its agendas. The picture so often painted is of scientists setting out to create some new creature with superlative powers. Unlikely and unhelpful as these pictures are, they equate scientists with playing the devil (and not God), since any venture of this nature would stem from human conceit regarding the unbounded power of human resources.

But who is doing the choosing? Think of a couple with cystic fibrosis in the family.¹⁶ These two young people have to make agonizing choices. These are ordinary people, without any sophisticated scientific or theological knowledge, having to determine the fate of embryos and children who will one day become adults. The situation facing them is not of their own making; they would never have elected to have to cope with a debilitating and tragic disease like cystic fibrosis. They have no control over the gene underlying this condition. The decisions they make have nothing to do with heroics or hubris. They are trying to sort out the dimensions of their family life in the midst of burdens and tears.

This couple has been told about the availability of pre-implantation genetic diagnosis (PGD). If this procedure shows that an embryo does not have any indication of cystic fibrosis, it will be transferred to the wife's uterus in the normal way. On the other hand, if the tests are positive, the embryo will be discarded and the same procedure will be carried out on a second embryo, and so on. The couple has to decide between the respective values of a four- or eight-cell embryo and a child. Any decision they make will have profound implications for at least one future individual, and even for those who will never develop beyond being very early embryos. It is their family and their children that are at stake. But they have no choice, since for them there is no escape from the reality of cystic fibrosis, and its devastating effects on any children they bring into existence.

This young couple has to exercise responsibility, but this is what being human is all

about. We cannot claim that we are made in the image of God, and then walk away from what that means—exercising responsibility, attempting to improve the world for ourselves and others, understanding as much as we can, and controlling what can be controlled.¹⁷

Let me make it quite clear, this couple does not have to go in a technological direction. They do not have to choose against any embryos or future individuals with cystic fibrosis. But, no matter what their views of the embryo, whether conservative or liberal or somewhere in between, they do have to choose, and they do have to live with the repercussions and consequences of their choices. These could include children with cystic fibrosis, children without cystic fibrosis, and embryos or fetuses that will never live as children suffering from cystic fibrosis. They can never escape from one or the other of these, because they are relational creatures. The precise direction they take will depend upon numerous factors—spiritual, the extent of family or church support, and the health care systems within society.

As we reflect on this couple with cystic fibrosis, we begin to see human embryos within the broader context of a family in peril. If the couple consents to any of their embryos being destroyed, it is because these particular embryos carry a gene that will result in children with cystic fibrosis. Either way, they are confronted by an agonizing moral choice—whether to dispose of the embryos or implant them in the wife's uterus knowing that a resulting child will suffer from a debilitating disease. The easy, and possibly morally preferable way out of this dilemma, is via ignorance; they are unaware of the options and can do nothing about them. They are shielded from making a difficult, and possibly invidious, decision; they will have to take what comes. This is precisely the position in which we repeatedly find ourselves, and yet we usually regard this as a position of weakness rather than of strength. Ignorance is not a virtue when confronted by malaria, tuberculosis, or dysentery, or by measles or smallpox, about which something can be done. In these instances, knowledge is preferable to ignorance, though in the earlier part of the twentieth century ignorance reigned supreme.

If we decide to opt for knowledge over ignorance, a choice between human embryos and the health status of future children has to be made in cases such as this one. At a more general level, research on human embryos raises similar issues, where the anticipated outcome of the research, albeit some distance into the future, is improvement of human health. The general thrust of acting as God's stewards comes into play here as well. There are two possible courses of action, both of which have problematic elements. This is where Christians (as well as others within the community) reach different conclusions, since specific biblical teaching is unavailable. A common approach is to seek a definitive answer to the question of when human life (personhood) begins. However, as the case of cystic fibrosis illustrates, the ethical dilemma emerges out of the choice that has to be made—between the interests of early embryos and that of children and adults who will have a potentially serious medical condition. To greater or lesser degrees this will always be the choice.

[Christians] should be guided in all their decisions by their dependence upon God. This will help them come to terms with the agonies and trauma of the ambivalence implicit within their moral decision-making.

Simple solutions will probably by-pass this choice, since they will concentrate on one party or one interest, out of all those directly or indirectly affected. In order to do justice to a range of theological motifs, a number of guiding principles will have to be consulted and balanced. These will not provide definitive answers, but they will hopefully enable us to construct a helpful forum within which to debate the respective merits of contending forces.

The *first motif* is provided by the urge to restore the material world: to improve it, care for it, and cure those with distressing conditions. Inevitably, our attention is on human beings in need of medical help and assistance. If there are current or imminent scientific measures that might realistically be able to alleviate serious illnesses under normal circumstances, they should be pursued. This should be within the bounds of a balanced life-style and broad overall interests. It is from this foundational

principle that we should turn to examine the specific issues emanating from the way in which we treat human embryos.

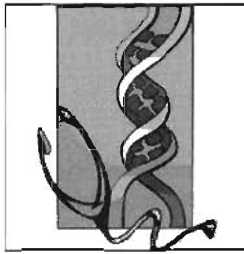
This introduces the *second motif*, which confronts us with the question of whether some of these conditions can best be tackled at the embryonic stage or later on in fetal or more likely in postnatal life. In searching for an answer here, we will be guided by the scientific and clinical evidence. Both stages may be relevant, and both should be amenable to further consideration. At any particular time, one may be preferable to the other on account of the level of clinical understanding and/or moral preferences.

In moving in the embryonic direction, a *third consideration* becomes relevant. Might the destruction of human life, even at its very earliest stages, lead to an objectification of human life? Any destruction of human life, or any use of human tissue following a tragedy, should prompt this consideration. Awareness that human powers can be used in manipulatory ways should instill caution into our grand ventures. After all, human dignity is readily sacrificed in the pursuit of meager ends. And yet, there is a balancing perspective. The other participants in therapeutic decision-making are also human beings, and neglecting what could be done to assist them may threaten aspects of their dignity. They may be held hostage, by unduly elevating rudimentary human life in the form of the earliest stages of human development. No one direction is self-evidently more appropriate either theologically or ethically, without working through the issues in each individual situation. Judgment and discernment are mandatory.

For Christians there is also a *fourth motif*, namely, one's dependence upon God. While this as a global principle will not immediately answer the sort of very specific questions raised in this discussion, it is the fundamental relationship that is the bedrock for all considerations such as these. The couple with cystic fibrosis in their family should be guided in all their decisions by their dependence upon God. This will help them come to terms with the agonies and trauma of the ambivalence implicit within their moral decision-making. Where there are no "correct" answers, there are answers that demonstrate faithfulness to one's relationship to God and one's position within a community of the Lord's people.

Some Questions and an Assertion

As science encroaches increasingly on realms that once lay outside human control, one has to ask whether the sphere of God's control is being eroded. In other words, do we wish to confine God's domain to areas of life where there is little, if any, human control? Indeed, is there an inverse relationship between divine and human control? Ques-



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tions of this ilk are especially poignant in the genetic area since genetic modification appears to have creative overtones. If we argue that the mandate to act as good stewards of God's creation is a limited mandate, in that it excludes the genetic realm, it behooves us to establish what those God-ordained limits are.

In the face of these possibilities, the position I have arrived at is that, since God is sovereign over all, he is sovereign over the genetic realm, just as he is over human life, human community, and the ecosphere. Divine grace and creativity are evident in all these realms, and human creativity is to follow suit. If we can say that God works through creation and, therefore, through what we describe as the natural world, there is no reason to say that he does not also work through the basic processes described by biology and, therefore, through genetic mechanisms.¹³ If this is true, we can go on to say that genetic modification brought about by humans has the potential for extending the work of God. This, too, has its dangers and its pitfalls, since appallingly injudicious choices can be made. However, if we refuse to go down this path, we will end with the appalling paradox of confining God's activity to an ever-shrinking and ever-decreasing realm of ever-increasing irrelevance. ♦

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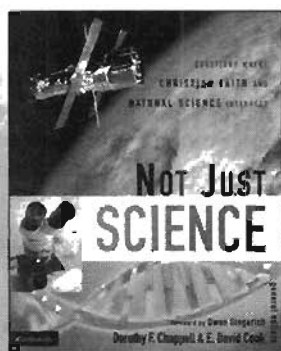
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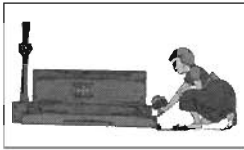
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Article

Challenges & Lessons from the Terri Schiavo Case

Challenges & Lessons from the Terri Schiavo Case

Hessel Bouma III



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*Under what
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In 1990, Terri Schiavo suffered severe brain injury yet lived fifteen years in a vegetative state dependent upon artificial hydration and nutrition. For more than seven years, Terri's husband and her family contested her condition, prognosis, and whether to withhold or continue her medical care through the court system, media, communities of faith, and the legislative and executive branches of the state and federal governments. An examination of medical, moral, religious, and legal aspects of withholding or withdrawing artificial hydration and nutrition suggests the judiciary branch acted responsibly in this tragic case. The Schiavo case challenges us to support more research into severe brain injuries, to prepare our Advance Directives appointing surrogate decision-makers and leaving clear and convincing evidence of our wishes should we be incapacitated, to affirm the lives and choices of persons with disabilities, and to address issues of fairness and justice in the allocations of medical technologies.¹

The 1960s and 1970s saw a rapid rise in biomedical technologies including cardiopulmonary resuscitation, cardiac by-pass machines, ventilators, and organ transplantation. Dr. Lewis Thomas perceived these as "half-way technologies," altogether too often failing to provide for a full recovery, instead leaving persons in diminished conditions, continually dependent upon technology and medicine.² In the midst of this biomedical revolution, many faith-based healthcare organizations—from hospitals to assisted living centers—adopted mission statements dedicated to saving and prolonging human lives without respect to financial costs, or the possibility that continued technological interventions might be perceived as prolonging dying.

These new technologies led to the rise of bioethics from distinctively Christian as well as secular perspectives. From the outset, scientific discoveries have led the way, often

far out in front of carefully considered bio-ethical responses, public policy, and legal decisions. Foremost among the many vexing questions was, "Under what circumstances, if any, might a person forego life-saving medical technologies?" Over ensuing decades, patients, families, healthcare practitioners and institutions have grappled with some very difficult cases about terminating life-sustaining medical treatments, while bio-ethicists, medical practitioners, the courts, and public policy have slowly and incrementally developed guiding principles and practices that are tested by new cases and further refined when deemed inadequate or unjust. The case of Theresa Schiavo provides such a test.

The Case of Theresa Schiavo³

Theresa ("Terri") Marie Schindler was born in Pennsylvania, on December 3, 1963, to Robert and Mary Schindler; her family came to include a brother and sister. In the early 1980s, Terri moved to Florida, where she worked as an administrator in an insurance office. In November 1984, she married Michael Schiavo, a restaurant manager. According to the Terri Schiavo Foundation, she attended Catholic mass and maintained a close relationship with her immediate family.⁴

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On February 25, 1990, at age 26, Terri collapsed from cardiac arrest in her home and suffered brain damage due to lack of oxygen. The cardiac arrest was attributed to an imbalance of blood potassium, probably linked to an eating disorder (over 7–8 years, her weight had dropped from 250 lbs to 110 lbs). After several weeks, she emerged from a coma into a vegetative state requiring a percutaneous endoscopic gastrostomy (PEG) tube to provide her with nutrition and hydration but no assistance in breathing. She was transferred to a skilled care and rehabilitation facility, and a court appointed Michael Schiavo as Terri's guardian without objection from her parents. Terri received care in several different skilled care facilities. Michael Schiavo and the Schindlers also attempted to care for her at home for several weeks, and she was taken to California for an experimental implantation of a thalamic stimulator in her brain.

In 1992, Terri was awarded \$250,000 in an out-of-court malpractice settlement. A malpractice trial (a simple blood test that might have detected the potassium imbalance had not been performed at an earlier office visit) resulted in further compensation — \$750,000 placed in trust for Terri's medical care and \$300,000 to Michael Schiavo for loss of companionship. With attorneys' fees, the awards approximated \$1.7 million.

In February 1993, Michael and the Schindlers had a falling out on her course of treatment. Michael decided further treatments were unwarranted and authorized "do not resuscitate" orders. When the Schindlers sought medical information on their daughter, Michael denied them access. The Schindlers attempted to remove Michael as Terri's guardian, but the court dismissed the suit. In March 1994, an initial guardian ad litem reported that Michael had acted "appropriately and attentively" to Terri.

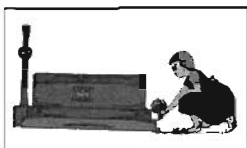
In May 1998, Michael asked the court to authorize removal of Terri's hydration and feeding tube. The Schindlers opposed the request, insisting that their daughter would want to remain alive in this condition. By year's end, a second guardian ad litem concluded Terri was in a persistent vegetative state (PVS) with no chance of improvement, but noted that Michael's decision-making might be influenced by the possibility of inheriting her estate. In the hearings and testimony before the circuit court, Michael Schiavo, his brother, and his brother's wife offered admitted hearsay that Terri had had conversations with them, following the deaths of several close family members, that she would never want to be placed upon artificial life support. While the initial guardian ad litem had expressed doubt about this testimony meeting the legal standard of "clear and convincing evidence" of her wishes, the local district court ultimately deemed that the nature of the testimony, while hearsay, was sufficiently credible and consistent to support its decision to discontinue artificial life support.

In February 2000, the local circuit court judge ruled the tube could be removed as consistent with her wishes. The Schindlers filed a petition asking the judge to permit a "swallowing test" to be performed on Terri to determine if she was capable of receiving nutrients on her own; the judge denied the petition but stayed his order until thirty days after the Schindlers exhausted all appeals. From January to April, the Schindlers and Michael Schiavo fired legal salvos against each other, appealing adverse decisions to higher courts including the Appellate Court, Florida Supreme Court, Federal District Court, and the United States Supreme Court. The trial court judge, upon the mandate of the Appellate Court, ordered Terri's hydration and feeding tube removed (clamped off) on April 24, 2001. Two days later, in response to an emergency motion from the Schindlers, a circuit court judge ordered the tube be reused.

Courts principally decide who should decide, not what the decision should be.

For two and one-half years, the Schindlers and Michael Schiavo continued their suits and countersuits throughout multiple levels of the judicial system before the District Court of Appeals ruled that Terri should be examined by five physicians, two to be chosen by the Schindlers, two by Michael Schiavo, and a fifth physician to be chosen by the court if the two parties could not mutually agree on that individual. On October 15, 2003, Terri's tube was removed on the orders of the circuit judge and the District Court of Appeals. On October 20 and 21, 2003, a special session of the Florida Legislature passed a bill, "Terri's Law," that allowed the governor to issue a "one-time stay in certain cases."⁵ Governor Jeb Bush issued an Executive Order directing reinsertion of the tube and appointing another guardian ad litem, Dr. Jay Wolfson, who also ultimately concluded that Terri was "in a persistent vegetative state with no chance of improvement."⁶

In September 2004, the Supreme Court of Florida issued a 7-0 declaration that the Florida law was unconstitutional, violating the separation of powers. From October into March, an incredible series of lawsuits were filed to continue Terri's PEG tube. These were dismissed at the local level, appealed to higher courts, and invariably rejected.⁷ Ultimately, Judge Greer ruled that on Friday, March 18, 2005, at 1:00 p.m., Michael Schiavo could have the PEG tube removed. As the date approached, the media began a crescendo that fostered prominent protests and matched the ongoing legal dissonance.



Article

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On the weekend of Palm Sunday, March 20, 2005, Congress returned shortly after the start of their week-long Easter break for an emergency session to pass legislation authorizing federal courts to review the case; the President returned from his Texas ranch to sign the legislation. The legislation, written exclusively for Terri Schiavo's case, authorized the federal courts to review whether her rights had been or were being violated. If, upon review, it appeared that any of Terri's rights might have been violated, then the courts could order temporary injunctive relief authorizing reinsertion of the PEG tube to sustain her life while a full court review could take place. Over the next eight days, the federal appellate court in Atlanta and the U.S. Supreme Court refused further reviews, accepting the preceding seven-year judicial process as appropriate. On Thursday, March 31, 2005, Terri Schiavo died, nearly thirteen days after removal of her PEG tube. Even as she died, her parents and husband continued their legal battles over who would be present at her autopsy and where her cremated ashes would be interred.

On June 15, 2005, the medical examiner released his autopsy report. He concluded there was no evidence that Terri had suffered any trauma prior to her 1990 collapse or had had a heart attack or had been given harmful drugs or substances before her death. Rather, her brain had deteriorated to approximately one-half its normal size and, in his opinion, the damage was consistent with a clinical diagnosis of PVS, irreversible, and precluded her eating or drinking orally. Furthermore, the brain damage indicated she was blind.⁸

The case of Terri Schiavo is unique in many respects and carries troubling implications. Usually, courts become involved when the family of an incompetent person cannot achieve consensus on an appropriate course of action. Courts principally decide *who* should decide, not *what* the decision should be. Until this case, medical ethical decisions regarding incompetent patients have been resolved in the courts, not in the executive and legislative branches of government.

The case of Terri Schiavo was particularly confounded by two issues. First, the malpractice settlement, while modest in size and dwindling due to medical and legal costs,

stood to be inherited by Michael Schiavo as her husband, or perhaps by the Schindlers if Michael had divorced Terri. In response to this possibility, Michael offered to donate whatever remained of Terri's medical trust fund to charity. Second, Michael Schiavo began dating other women—with the Schindlers' blessings before any malpractice awards had been attained—and was and is engaged to be married to a woman who has borne two children with him.

Relevant Historical Developments

Until the late 1960s, death had been defined as the irreversible cessation of heart and respiration. The development of heart by-pass machines and artificial respirators coupled with the desire and ability to transplant organs necessitated a new definition of death. In 1968, it was proposed that death be defined as the irreversible loss of whole brain function.⁹ In remarkably short order, states adopted the new medical and legal definition of death.

In 1975, 21-year-old Karen Ann Quinlan suffered cardiopulmonary arrest following the ingestion of alcohol and prescription sedatives. Never regaining consciousness, she emerged from the coma to a state of wakefulness (arousal) without cognition and awareness, a condition newly defined as a persistent vegetative state (PVS).¹⁰ Gradually, as her parents came to perceive her ventilator as an extraordinary treatment, and her condition as hopeless, they sought permission from the courts to disconnect the respirator. The New Jersey Supreme Court concurred, and the ventilator was discontinued, though she continued to breathe on her own. She died in 1986 from extensive infections; in an effort to further our understanding of the condition of PVS, her parents authorized an autopsy and publication of the results.¹¹ The Quinlans never viewed their daughter's hydration and nutrition tube as an extraordinary treatment.

In 1977, a 67-year-old, profoundly mentally-impaired (reportedly IQ = 10) man named Joseph Saikewicz was diagnosed with leukemia. A court-appointed guardian advised against chemotherapy; the probate and appellate courts of Massachusetts agreed. They reasoned that incompetent

patients should not be denied a right to refuse treatment and clarified the standard of substituted judgment to include the present and future incompetence of the individual—a “best interests standard” imagining what the incompetent patient would consider in his best interests under these conditions.

Medical practice and the courts have tended to move slowly, deliberately, and incrementally in establishing new, acceptable practices under unusual circumstances.

In 1986, the Supreme Court of Massachusetts, in a 4-3 decision, authorized removal of the hydration and nutrition tube sustaining the life of Paul Brophy. A firefighter and emergency medical technician, Brophy had suffered a brain aneurysm three years earlier at age 46 and lapsed into a PVS. Brophy had once been awarded a medal for rescuing a man from a burning fire, an award he subsequently pitched upon learning that the man had never regained consciousness before dying several months later. He told friends and family that he would never want to be sustained like that. Mrs. Brophy, their five adult children and his seven siblings all concurred in the decision to remove the hydration and nutrition tube. Paul Brophy died eight days later, a dying described as “extremely peaceful.”

In 1983, Nancy Cruzan was seriously injured in a one-automobile accident in Missouri. In PVS, her parents sought to have her hydration and nutrition tube removed over the objections of the healthcare institution and the state. The probate court judge, while agreeing with the Cruzans, requested an appeal directly to the Missouri Supreme Court that overturned the decision. In 1990, the U.S. Supreme Court rendered an ambivalent 5-4 decision that a hydration and nutrition tube could be removed from an incompetent patient if there was “clear and convincing evidence” that this was what the patient would desire. No such evidence had been presented of Nancy’s wishes. That fall, sufficiently clear and convincing evidence of Nancy’s wishes was provided to the probate court, her hydration and nutrition tube was removed, and Nancy died a peaceful death twelve days later.¹² Concurrently, the U.S. Congress passed the Patient Self-Determination Act (PSDA), legislation encouraging people to compose

Advance Directives leaving clear and convincing evidence of their wishes for medical care and surrogate decision-makers in the event they are incapacitated.

More recently, two cases requesting authorization to remove hydration and nutrition tubes of severely neurologically impaired individuals *not* in PVS were refused by state courts. In Michigan, a car-train accident left Michael Martin, age 36, in a “locked-in condition.” Five years later, his wife requested removal of the hydration and nutrition tube as being consistent with his unwritten wishes and how he lived his life. Michael’s sister and mother objected. The local court and Appeals Court agreed with his wife, but the Michigan Supreme Court in a 6-1 decision overturned the lower court decision; the U.S. Supreme Court refused to hear the case. Mr. Martin died several years later when the tube inadvertently came out, and no one insisted upon its reinsertion.

In California, Robert Wendland, age 42, was injured in a truck accident which left him “minimally conscious.” Two years later, his wife, sister, and daughter requested removal of his hydration and feeding tube; his mother disagreed. Six years later, he died of pneumonia, one month before the California Supreme Court unanimously ruled against discontinuation of his hydration and feeding tube.¹³

These key cases reflect that medical practice and the courts have tended to move slowly, deliberately, and incrementally in establishing new, acceptable practices under unusual circumstances. A careful reading of the records would not support the sense that these decisions have been precipitous or a headlong rush down a slippery slope.¹⁴

Three Altered Neurological States: Coma, PVS, and MCS

Severe brain trauma short of death typically produces a coma—complete loss of consciousness lasting for at least one hour. In a coma, the individual’s eyes remain closed and they cannot be aroused.

In the mid-1990s, a medical task force on PVS reported its findings, and numerous medical organizations soon followed with guidelines for the diagnosis and treatment of individuals in PVS.¹⁵ The PVS is characterized by (1) a complete unawareness of the self and the environment, (2) sleep-wake cycles, (3) either complete or partial preservation of hypothalamic and brain stem function, (4) no evidence of sustained, reproducible, purposeful, or voluntary behavioral responses to visual, auditory, tactile, or noxious stimuli, (5) no evidence of language comprehension or expression, (6) bowel and urinary incontinence, and (7) variably preserved cranial-nerve and spinal reflexes. The original Task Force was willing to declare a patient in PVS if they were still in a vegetative state one month after an acute traumatic or nontraumatic brain injury or lasting



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character
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someone to be
a person?*

for at least one month in patients with degenerative, metabolic disorders or developmental malformations. Others have suggested holding off with the designation of PVS until an individual has been vegetative for at least twelve months.¹⁶

The diagnosis of PVS is complex and not strictly objective since the presence or absence of consciousness can only be inferred. Diagnosis is based upon (1) the presence of reflexes characteristic of subcortical functioning rather than learned voluntary responses, and (2) laboratory tests consisting of a combination of EEG with CT-scans and MRI¹⁷ revealing lesions so numerous, severe, and/or diffuse to make awareness highly improbable, and PET-scans¹⁸ determining the extent to which metabolism and/or cerebral blood flow is reduced. From 10,000 to 25,000 individuals are estimated to be in PVS at any given time in the United States.¹⁹ Recovery from PVS is unlikely after one year, with both the likelihood and the degree of recovery diminishing as length of time in PVS increases.²⁰ While there are widespread stories of individuals regaining full or nearly full functioning after extended time in "comas" or "PVS," members of the Multi-Society Task Force on PVS investigated these cases and found no more than anecdotal evidence.²¹

Individuals in PVS raise a significant existential question. Is someone in PVS still a person, or is the capacity for neurological functioning, at least to the extent of awareness, an essential character necessary for someone to be a person? Quite frequently, loved ones of someone in PVS gradually, over time, come to refer to their loved one in the passive tense: "This was my daughter." Within the Judeo-Christian faith traditions, one of the primary ways in which we image God is relational—through our four-fold, bi-directional relationships with God, self, others, and creation.²² Robert Wernberg, Christian philosopher and ordained Presbyterian minister concludes:

What is of special value about human life is personal consciousness, which makes it possible for the individual to participate in God's creative and redemptive purposes for human beings; biological human life is valuable because it sustains and makes possible personal consciousness, but where

there is only biological or somatic human life, that special value no longer attaches to the individual, and biological or somatic death may be allowed to proceed unimpeded.²³

The individual in PVS, if it is irreversible, has irreversibly lost the capacity for these bi-directional relationships. Sustained with artificial hydration and feeding, they can be the recipient of God's care, our care, and impacted by nature, but they are unable to relate to us or nature, and it is difficult for us to imagine how they can relate to God. Of course, we do not know with absolute certainty when individuals are in irreversible PVS until they die, yet we must face key biomedical decisions with the vague prognosis of "unlikely to recover." The gospel writers record Jesus's words of immense hope, "... with God all things are possible" (Matt. 19:26, Mark 10:27, and Luke 18:27). May Christians, who believe in miracles and in an omnipotent and loving God, continue to pray for God's miraculous intervention even while deciding to withhold or withdraw life-sustaining medical treatments?

More recently, a multi-society task force of neurologists sought to define—based on consensus guidelines rather than evidence—a "minimally conscious state" (MCS) for the 112,000 to 280,000 persons with severe brain injury not quite in PVS.²⁴ In the MCS, patients have partial consciousness; sleep/wake cycles; sufficient motor function to localize noxious stimuli, reach for objects, hold or touch objects in accordance with shape, and automatic movements such as scratching; localized sound location; sustained visual pursuit; inconsistent but intelligible verbalization or gesture; and contingent smiling or crying. Persons emerging from MCS show gradually greater and dependable functionality.

A significant majority of the physician consultants who examined Terri and reviewed her medical records, and judges who reviewed the testimony and records, concluded that she was in PVS.²⁵ The biomedical evidence suggests that someone in PVS is incapable of suffering. Furthermore, the majority of the judges who heard and reviewed the evidence accepted the assertion that she would not want to be sustained in this condition. Despite all this, the Schindlers with the support of many reli-

gious, Right-to-Life and disability groups disputed the diagnosis of PVS and believed she retained some capability for recovery if she was given additional rehabilitation and treatment. They insisted that Terri would want to be sustained as she was and that by removing the PEG tube, they would be killing her, and she would die a gruesome death by dehydration and starvation.

Removing Artificial Hydration and Nutrition

When a person sustains sickness or trauma, the body's natural response is to shut down the digestive processes and diminish or even kill the person's appetite for food. Before the advent of hydration and tube feedings, recovery from major sickness or trauma was impeded by the lack of adequate nutrition, yet such individuals did not sustain additional suffering because they had lost their appetite and were not hungry. Deprivation of water, however, does quickly lead to dehydration, dementia, and suffering in a fully conscious person.

With the development of intravenous, nasogastric, and PEG tubes, it became feasible to provide both nutrition and hydration independent of appetite, allowing persons adequate nutrition and hydration to recover from sickness and accidental or surgical trauma. Some persons—with advanced Alzheimers, amyotrophic lateral sclerosis (ALS) or cancer—who formally died gradually and naturally yet comfortably with minimal suffering as their ability and desire to eat waned could now be sustained. Until the technology of hydration and nutrition tubes was developed, persons with severe neurological trauma did not survive long enough to enter PVS. Is there an obligation to provide hydration and nutrition through tube feedings under any and all circumstances, or are there instances in which it is permissible to withhold or withdraw them?

As the Terri Schiavo case demonstrates, the withholding or withdrawing of hydration and feeding tubes can be a most vexing and divisive ethical decision. On the one hand, food and water are so basic to life. We may not deprive people of access to food and water; to do so constitutes abuse and, if they die as a consequence, does it not constitute murder? Scripture lends support for this position. As Christians, we are called to defend the weak, the sick, and the powerless. In the Christian tradition, it is Jesus Christ who reminds us that when we see someone who is hungry, we are to give them food, and someone who is thirsty, we are to give them drink (Matt. 26: 31-46). We can and may rejoice when hydration and feeding tubes lead to healing or sustaining human life.

On the other hand, food and water through intravenous lines, nasogastric tubes, or PEG tubes are artificial or unnatural, mechanical, medical treatments. They can be invasive to our bodily integrity, as alien as ventilators that

force breathing. Artificial hydration and nutrition tubes sometimes may be perceived more as prolonging dying than sustaining living. When artificial hydration and nutrition tubes do not lead to healing but sustain suffering in a conscious person's life or simply sustain life in an unconscious person, does it not leave these persons enslaved to invasive medical technology? May the conscious person not choose to forego the treatment? May family and friends not choose also for their unconscious loved one to be freed from the invasive treatment?

Unlike physician-assisted suicide and voluntary or involuntary euthanasia, the act of removing artificial hydration and feeding tubes does not intend death nor is it the primary cause of death.

In societies in which it is feasible to provide artificially hydration and nutrition (and many of the societies of our world cannot), it is most important to offer hydration and nutrition tubes, but respect for each patient's bodily integrity must allow him or her the freedom to choose to forego this treatment. Allowing persons and their surrogate decision-makers to withhold or withdraw artificial hydration and nutrition also can be seen as consistent with Christian values. Life is a good, but not an absolute good that must be sustained under any and all circumstances; to insist upon that is to make human life a god.²⁶ In the Christian tradition, "God's cause includes life, human flourishing, and embodied integrity ..." God's cause is "life, not death; health, not sickness; freedom, not bondage; care, not condemnation."²⁷

With patients in PVS, removing artificial hydration and feeding tubes does not result in the patient's suffering as they lack the neurological capacity to perceive and process pain and suffering. Unlike physician-assisted suicide and voluntary or involuntary euthanasia, the act of removing artificial hydration and feeding tubes does not intend death nor is it the primary cause of death. Rather, it accepts that death is the likely outcome and allows death to occur without further invasion of bodily integrity, a death that surely would have occurred after the initial neurological trauma leading to PVS had artificial hydration and nutrition not been instituted in the first place. In the one to two weeks it typically takes for the individual's organs to decline due to dehydration and chemical imbal-



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ances, there remains the opportunity for divine intervention, compassionate care, and loving, supportive family and friends to bid their sad final farewells while thanking God for the life of their loved one. Good, compassionate care, even as a patient in PVS is dying (basic hospice or palliative care) provides ice chips for the patient's mouth, eye drops for the eyes, and moist cloths for exposed skin. Healthcare practitioners, family members and friends of someone in PVS dying after the removal of artificial hydration and nutrition almost invariably report that their dying, while sad, was very peaceful.

Lessons

First, given the many confounding factors present in the Schiavo case, it is unlikely to set much if any new legal precedent. Particularly troubling, however, is the unprecedented involvement of the more political legislative and executive branches of state and federal governments in an individual case. There are adequate checks and balances in the levels of the judicial system, and courts have not acted precipitously or hastily. That the healthcare system and Michael Schiavo sustained care for Terri in PVS for more than fifteen years, the last seven of them as her case slowly progressed through the appropriate courts reflects considerable caution and patience. The Florida Supreme Court decision declaring "Terri's Law" unconstitutional and the refusal of the federal appellate court and U.S. Supreme Court to further review the case appear to uphold this practice.²⁸

The legislative and executive branches of state and federal governments do have important roles to fulfill in setting policies affecting end-of-life care. Society would be well served if Congress and the executive branch would address the many inequities in the U.S. healthcare system including assuring a basic minimum of healthcare for persons who are uninsured or underinsured, funding Medicaid and Medicare at levels that adequately cover actual expenses, and setting standards for Advance Directives that would assure their legal recognition throughout the entire country. As Stephen Lammers noted: "One cannot demand that Schiavo and others in her condition be treated while cutting funding for health care." He also noted the irony that Terri's

long-term care was achieved through a combination of a sizeable malpractice settlement and government healthcare programs, and legislators who were arguing to sustain her life were also seeking to limit the size of malpractice settlements or cutting funding for aspects of Medicare and Medicaid.²⁹

Second, there remains a profound need for more neurological research in brain trauma, PVS, and MCS. Can we develop better diagnostic techniques to distinguish those patients who are comatose or vegetative but showing a likelihood of recovery from those who are unlikely to recover? Such research may enable our diagnoses and prognoses to be more objective.³⁰ Here, too, Congress and the executive branch can promote additional biomedical research into PVS and MCS.

Third, we need to encourage everyone to develop an Advance Directive³¹ which designates one's preferred surrogate decision-maker (or Durable Power of Attorney for Healthcare Decisions) and what kinds of treatments one would want or not want in the event one is incapacitated. For Christians, this is an opportunity to express our Christian values about our own living and dying, recognizing that death, while still an enemy, is a conquered enemy and acknowledging that God is sovereign over life and death. Ideally, the surrogate decision-maker knows the person and the person's values well, and is willing and able to make healthcare decisions in a manner consistent not with the surrogate decision-maker's values but the values of the person who is now incapacitated and incompetent. In the absence of an Advance Directive specifying a designated surrogate decision-maker, most states turn, in descending order of priority, to (a) the spouse, (b) an adult son or daughter, (c) either parent, or (d) an adult brother or sister, or they may appoint an unrelated surrogate-decisionmaker.

If there was a single point in time when the Schindlers lost their case for sustaining their daughter's life, it was when her husband of five years, Michael Schiavo, was appointed her guardian at his request, consistent with the laws of the state of Florida, and with the support of the Schindlers. As more and more families are dysfunctional or spread out geographically, and couples of

the opposite or same sex live in a close but non-marital relationship together, it is increasingly difficult to ascertain who might be the best surrogate decision-maker for a patient. When couples enter into the covenant of marriage, just when does a spouse become a better surrogate decision-maker than the parents and family?

The 1990 Patient Self Determination Act requires all healthcare professionals and institutions in the United States to provide assistance in making an Advance Directive. Despite these provisions for more than a decade, the majority of Americans still do not have an Advance Directive. Advance Directives, while potentially very helpful, are not cure-alls. To be effective, they need to be shared with closest family and friends, and reviewed regularly, particularly as life changes. And while an Advance Directive in Terri's situation could have made her wishes as clear and convincing as possible, its legitimacy could still have been tested in the courts. Christians should prepare Advance Directives to make clear their wishes consistent with their Christian values regarding life and death.³² To do so is a profound act of love, easing some of the burden of these decisions from loved ones when tragedy strikes. With good communication about our Advance Directives, our dying is much more likely to be private, peaceful, with dignity, and not public court battles.

Fourth, we need to constantly reassure persons with disabilities through words and actions that they are valued and their wishes for medical treatment to be administered or withheld or withdrawn will be honored. Honoring Terri Schiavo's wishes under these circumstances need not be and ought not be a cause for fear that we are descending a precipitous slippery slope leading to involuntary euthanasia for persons with disabilities. At the same time, it is likely that one of the next morally vexing end-of-life issues will be whether we may remove artificial hydration and nutrition from individuals in MCS in the absence of clear and convincing written evidence, such as has been rejected by state Supreme Courts in Michigan with Michael Martin and California with Robert Wendland. But what these cases seem to foretell is that it is likely to be a very slow — appropriately so — process.

Fifth, the Christian community as well as society as a whole need to engage in the difficult conversations about fairness and justice in the allocations of resources including medical technologies. Most of the leading causes of human morbidity and mortality in the world today are preventable or treatable, many at only modest expense by U.S. standards, if only we had the appropriate resolve. A Christian "culture of life" will not rest until it has pursued fairness and justice for all our neighbors. ♦

Notes

¹An abbreviated version of this paper was presented as "Medical Ethics & Neurosciences at the End of Life: Lessons from the Terri Schindler-Schiavo Case" in the Medical Bioethics Symposium at the 59th Annual Meeting of the American Scientific Affiliation, Trinity Western University, Langley, British Columbia, July 24, 2004. The paper includes additional developments through June 16, 2005.

²Lewis Thomas, "The Technology of Medicine," *New England Journal of Medicine* 285, no. 24 (1971): 1366–8. Also reprinted in Lewis Thomas, *The Lives of a Cell: Notes of a Biology Watcher* (New York: The Viking Press, 1974), 31–7.

³The case story through 2003 is assembled from Thomas Fields-Meyer, "Who Decides?" *People* 60, no. 19 (2003): 80–2; Cathy Lynn Grossman, "Tricky Business' in a Life-and-Death Debate," *USA Today* (October 23, 2003), p. 6D; Richard Jerome, "What to Do About Terri," *People* 53, no. 6 (2000): 77–8; Claudia Wallis, "The Twilight Zone of Consciousness," *Time* 162, no. 17 (2003): 43–4; and Richard Willing, Anita Manning, and Deborah Sharp, "Florida Case Raises Hard End-of-Life Questions: Unique Legal, Medical Issues Surround Schiavo," *USA Today* (October 23, 2003), 1A–2A. For an extensive timeline of the events and links to key legal documents, see www.miami.edu/ethics2/schiavo/timeline.htm; last accessed: June 15, 2005.

⁴Terri Schindler-Schiavo Foundation, www.terrisfight.org; last accessed: May 17, 2005; as of June 16, 2005, the site is under reconstruction to undertake a new mission in the memory of Terri Schiavo. The Foundation stated it is operated by "a group of volunteers dedicated to protecting the life and liberty of a disabled woman." As an advocacy group, its portrayal of events in Terri's case were not without bias, appearing to be most consistent with the views of Robert and Mary Schindler.

⁵For the text of the law, see http://election.dos.state.fl.us/laws/03laws/ch_2003-418.pdf. Note that the law appoints a guardian ad litem to report not only to the court, but also the governor, and for the law to apply, the court must have found the patient to be in PVS.

⁶Dr. Wolfson's remarkable report is accessible at www.miami.edu/ethics2/schiavo/wolfson%27s%20report.pdf; last accessed: June 16, 2005.

⁷An appeal by the Governor and the Schindlers of the Supreme Court of Florida ruling was subsequently rejected as well. At one point, the Schindlers sought another trial predicated upon a new argument that Terri would want to be kept alive in this condition since she was Catholic and last March, Pope John Paul II said that people in vegetative states have a right to health care and nutrition. Attorneys for Michael Schiavo contended that Terri was not a practicing Catholic and that her religious beliefs had been taken into account in earlier decisions.

⁸Abby Goodnough, "Schiavo Autopsy Says Brain Was Untreatable," *New York Times* (June 16, 2005), A1 & A5; in an unprecedented move, but to refute numerous allegations, Michael Schiavo authorized the public release of Terri Schiavo's autopsy report at <http://news.findlaw.com/nytimes/docs/schiavo/61305autopsyrpt.pdf>; last accessed: June 16, 2005.

⁹"A Definition of Irreversible Coma. Report of the Ad Hoc Committee of Harvard Medical School to Examine the Definition of Brain Death," *Journal of the American Medical Association* 205, no. 6 (1968): 337–40.

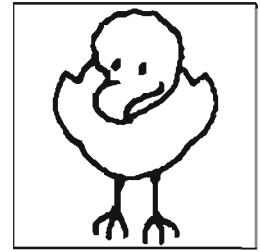
¹⁰B. Jennett and F. Plum, "Persistent Vegetative State After Brain Damage. A Syndrome in Search of a Name," *Lancet* 1 (1972): 734–7.

¹¹Hannah C. Kinney, Julius Korein, Ashok Panigrahy, Pieter Dikkes, and Robert Goode, "Neuropathological Findings in the Brain of Karen Ann Quinlan—The Role of the Thalamus in the Persistent Vegetative State," *New England Journal of Medicine* 330, no. 21 (1994): 1469–75.

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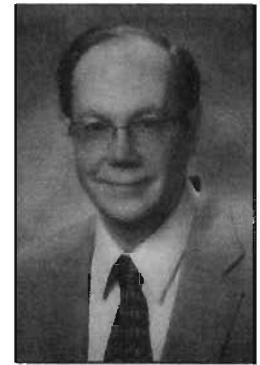
- ¹²Much has been made and written of the Nancy Cruzan case. For an extraordinary, in-depth look at the personal, familial, legal, and political dimensions of the case, see the *Frontline* episode, "The Death of Nancy Cruzan," which aired on 24 March 1992, or the book written by the Cruzan's attorney throughout their ordeal, William H. Colby, *Long Goodbye: The Deaths of Nancy Cruzan* (Carlsbad, CA: Hay House, Inc., 2002).
- ¹³Bernard Lo, Laurie Dornbrand, Leslie E. Wolf, and Michelle Groman, "The Wendland Case—Withdrawing Life Support from Incompetent Patients Who Are Not Terminally Ill," *New England Journal of Medicine* 346, no. 19 (2002): 1489–93.
- ¹⁴The situation described pertains to adults. The situation for children is somewhat different, partially decided by the courts with levels of interventions having been mandated by Presidential order under the Department of Health and Human Services, subsequently tested in the courts, and ultimately legislated by Congress in the Child Abuse Amendments of 1984. For an excellent review of these developments and their present standing, see John A. Robertson, "Extreme Prematurity and Parental Rights After *Baby Doe*," *Hastings Center Report* 34, no. 4 (2004): 32–9.
- ¹⁵Multi-Society Task Force on PVS, "Medical Aspects of the Persistent Vegetative State," *New England Journal of Medicine* 330, no. 21 (1994): 1499–1508, and 330, no. 22 (1994): 1572–79.
- ¹⁶J. Hume Adams, D. I. Graham, and Bryan Jennett, "The Neuropathology of the Vegetative State After an Acute Brain Insult," *Brain* 123 (2000): 1327–38.
- ¹⁷Andreas Kampfl, Gerhard Franz, Franz Aichner, et al., "The Persistent Vegetative State After Closed Head Injury: Clinical and Magnetic Resonance Imaging Findings in 42 Patients," *Journal of Neurosurgery* 88 (1998): 809–16.
- ¹⁸Nicholas D. Schiff, Urs Ribary, Diana Rodriguez Moreno, et al., "Residual Cerebral Activity and Behavioural Fragments Can Remain in the Persistently Vegetative Brain," *Brain* 125 (2002): 1210–34.
- ¹⁹Hannah C. Kinney and Martin A. Samuels, "Neuropathology of the Persistent Vegetative State: A Review," *Journal of Neuro-pathology and Experimental Neurology* 53, no. 6 (1994): 548–58.
- ²⁰See A. Kampfl, E. Schmutzhard, G. Franz, et al., "Prediction of Recovery from Post-traumatic Vegetative State with Cerebral Magnetic-imaging," *Lancet* 351 (1998): 1763–7. The study followed 80 adult patients with closed-head injury. After twelve months, 42 were in PVS and 38 were showing some signs of recovery. Of those showing signs of recovery, clinical evaluations had detected the signs of recovery for 62% of the patients at three months, and 96% of patients at six months.
- ²¹The case of Gary Dockery illustrates the problem. A Tennessee policeman, he was shot in the head in 1988 and was seriously neurologically impaired. Seven and one-half years later, as pneumonia set in, he suddenly began talking for eighteen hours, recalling names and events from before his injury. He was sedated for surgery but never regained consciousness after surgery, and died fourteen months later. Neurologists emphatically insisted he had not been in PVS but probably had been "minimally conscious." Seriously misleading headlines fueled the public's misconceptions and myths: Melina Beck and Vern E. Smith, "To Him It Was Still 1988: The 'Coma Cop' Wakens," *Newsweek* (26 February 1996): 56; and "Officer Who Emerged from Long Coma Dies," *New York Times* (15 April 1997), Section A, p. 21. A recent news article states: "Dr. Bernat [a member of the Multi-Society Task Force on PVS] said his 1994 panel looked into more than 70 'alleged late recoverers' and found that 'there wasn't a single one that was verified, so I'm very skeptical.'" Donald G. McNeil, Jr., "In Feeding-Tube Case, Many Neurologists Back Courts," *New York Times* (26 October 2003), Section 1, p. 18. More recently, the case of Donald Herbert, a Buffalo, New York, firefighter seriously brain injured in 1995, raised similar concerns. He emerged from a coma to progress to what is probably the minimally conscious state, and then dramatically began speaking coherently for fourteen hours. Several media reports erroneously reported he had emerged from a coma, but most made a special effort to point out that he had been in MCS rather than PVS, and that his situation differed from that of Terri Schiavo.
- ²²Hessel Bouma III, Douglas Diekema, Edward Langerak, Theodore Rottman, and Allen Verhey, *Christian Faith, Health, & Medical Practice* (Grand Rapids, MI: Eerdmans, 1989), 33.
- ²³Robert N. Wennberg, *Terminal Choices: Euthanasia, Suicide, and the Right to Die* (Grand Rapids, MI: Eerdmans, 1989), 176.
- ²⁴J. T. Giacino, S. Ashwal, N. Childs, et al., "The Minimally Conscious State: Definition and Diagnostic Criteria," *Neurology* 58 (2002): 349–53; James L. Barnett, "Questions Remaining About the Minimally Conscious State," *Neurology* 58 (2002): 337–8. For an intriguing account of someone who seems to be emerging from his minimally conscious state, see Carl Zimmer, "What If There Is Something Going On in There?" *New York Times* (28 September 2003), Section 6: 52–6.
- ²⁵For a thorough accounting, see the report of Jay Wolfson, Guardian ad Litem at www.miami.edu/ethics2/schiavo/timeline.htm as an entry under 1 December 2003; last accessed: May 17, 2005. Note, too, that for "Terri's Law" to apply to her, it had to be acknowledged that she was in PVS; Governor Bush's Executive Order acknowledged the PVS diagnosis.
- ²⁶Allen Verhey, "Taking Sides for Schiavo: Necessary Decisions," *Christian Century* 122, no. 8 (2005): 9–10.
- ²⁷Bouma III, et al., *Christian Faith, Health, & Medical Practice*, 21.
- ²⁸For a thoughtful secular analysis from the perspective of a prominent healthcare law professor, see George J. Annas, "'Culture of Life' Politics at the Bedside—The Case of Terri Schiavo," *New England Journal of Medicine* 352, no. 16 (2005): 1710–5.
- ²⁹Stephen E. Lammers, "Schiavo and the Health Care System: What Wasn't Discussed," *Christian Century* 122, no. 8 (2005): 11.
- ³⁰First, the call for additional research includes the NIH Consensus Development Panel on Rehabilitation of Persons With Traumatic Brain Injury, "Rehabilitation of Persons With Traumatic Brain Injury," *Journal of the American Medical Association*, 282, no. 10 (1999): 974–83. Second, much of the sorely needed research would have minimal risk (and probably marginal benefits to most patients undergoing the research but considerable potential benefit to future patients, their families and society) and could be done with the abundance of patients in PVS and MCS if their surrogate decision-makers approved. Third, some significant preliminary work has and is being done.
- ³¹A model Advance Directive called "Five Wishes" is available at www.agingwithdignity.com. This Advance Directive, legally recognized in 35 states and the District of Columbia, encourages the individual to identify (1) the person he or she wants to make medical care decisions when the individual cannot, (2) the kind of medical treatment the individuals wants or does not want, (3) how comfortable the individual wants to be, (4) how the individual want people to treat him or her, and (5) what the individual wants his or her loved ones to know.
- ³²To consider some thoughtful positions by Christians on the issues of withholding and withdrawing medical treatments, see, for example, Chapter 10 on "Death and Covenantal Caring" in Bouma III, et al., *Christian Faith, Health, & Medical Practice*, 268–307; The authors carefully develop four end-of-life principles for Christians: (1) A Christian need not regard the mere prolongation of biological life as intrinsically beneficial; (2) A Christian need not strive to endure irremediable and intense suffering when it eclipses the good of relationships with God, self, and others; (3) Christians should not be devastated by the state of dependency that sometimes characterizes sickness and dying; and (4) End-care decisions Christians make for themselves must not be grounded exclusively in how these decisions affect them personally. See also, chapter 5 on "Passive Euthanasia" and chapter 6 on "The Permanently Unconscious Patient" in Robert N. Wennberg, *Terminal Choices: Euthanasia, Suicide, and the Right to Die* (Grand Rapids, MI: Eerdmans, 1989), 108–77.



The History of the Dodo Bird and the Cause of Its Extinction

Jerry Bergman

A careful reevaluation of the Dodo bird by several contemporary researchers has found that many of the widely accepted conclusions about it are erroneous. For example, the Dodo was not a fat, slow, inferior, defenseless bird but was a swift and fierce fighter if it was threatened. The common conclusion that it was defenseless is due partly to the fact that it did not have a natural fear of humans or many animals. Often used as the prime example of how evolution prunes out the weak, its extinction does not demonstrate the efficacy of natural selection in eliminating inferior animals but the wanton disregard of animal life by humans. Now regarded by contemporary researchers as a wonderful, magnificent creature, its loss is a tragic event in history that eloquently illustrates the need for stewardship of the Earth's resources, a topic to be discussed in the conclusion.



Jerry Bergman

A classic example of Darwinism in action (and the most widely publicized symbol of extinction due to inferiority) is the Dodo bird.¹ Since their discovery by Westerners in the 1500s, Dodos were sketched, painted, and sometimes lampooned. It was just the right bird for Lewis Carroll's *Alice's Adventures In Wonderland's* menagerie of off-beat animals. The Dodo that Alice met was "faintly absurd ... [and] spoke in words of many syllables."² The Dodo has been the subject of an "exceptional amount of popular commentary, folklore and illustrations."³ The Dodo bird (formerly *Didus ineptus*, and now *Raphus cucullatus*) is in the order Columbiformes. This extinct, nonflying, allegedly "obviously unfit," fat, dumb bird has also been used as a prime example of proof of evolution by natural selection, as illustrated by Stevens' claim: "Less successful organisms would seem to argue for the messy, often dead-end process of evolution: the dodo ..."⁴

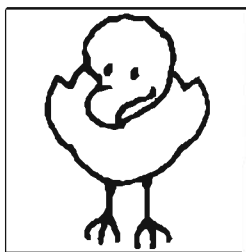
Some may conclude that the humans won and the Dodos lost in the struggle for life. Darwin and the developers of natural selection have defined natural selection since his classic 1859 *Origin of Species* in terms of competition between animals for food or mates. The animals that possessed a superior ability

to gather food and escape enemies would eventually become dominant, and the inferior animals would become extinct. The Dodo, though, did not become extinct because humans or animals were competing with them for the same food supply. They became extinct for the same reason that animals, such as the passenger pigeon, became extinct—human greed, carelessness, and the contingencies of history.⁵

The demise of the Dodo has become a fixture of our language, and a symbol of the extinction of inferior animals. Expressions such as "dead as a Dodo," referring to something that is forever gone and very much a thing of the past, is one example.⁶ The term as applied to a person refers to one who lacks intelligence, is addled, or looks silly.

A classic example of Darwinism in action (and the most widely publicized symbol of extinction due to inferiority) is the Dodo bird.

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Mauritius, the
White Dodo,
the Solitaire of
Reunion, and
the Rodriguez
Solitaire.*

Although the word "Dodo" is Portuguese for simpleton, the Portuguese did not remain on the island where Dodos lived after discovering them and, evidently, Portuguese writings of the time do not contain references to Dodo birds.⁷ Others argue that the word "Dodo" came from an onomatopoeia mimicking the bird's call.⁸

Illustrations and reconstructions often show the Dodo as a magnificently overweight, pigeon-like bird that allegedly had a "large body and small wings, far too small to permit him to fly."⁹ The most famous reconstruction of the Dodo was conducted in the taxidermy studio of Roland Ward in London. Ward's reconstruction is now in the American Museum of Natural History Flying Bird Hall located near a completely restored Dodo skeleton.¹⁰ The popularity of these exhibits indicate the modern interest in the Dodo.

The Dodo probably is not only the best-known extinct modern species, but also a *prime* exhibit of the efficacy of natural selection's ability to prune out the weak and inferior animals. Owen even argued that the simple fact of its extinction by itself sealed the case for its inferiority.¹¹ Some scientists go even further, using evolution to justify, or at least condone, the extinction of the Dodo and other animals. Darlington writes:

Extinction is a natural process essential to evolution ... man's role in it, and ethical implications ... is a difficult subject for me to write about. Many conservationists ... will not like what I say. But the subject is evolution-related, and I have to treat it. Man's evolution, multiplication, and occupation of the world have inevitably caused the extinction of many plants and animals, directly or indirectly. Man has hunted or is hunting many animals to extinction, either for food (for example, the Dodo on Mauritius, some of the giant tortoises on the Galapagos, and probably the moas in New Zealand), for sport (for example, the Ostrich in Arabia), or in self-defense (for example, the Lion, which has been retreating before man for 2000 years). Current lists of extinct and vanished species include many more examples.¹²

Darlington then admits that "it has been man's role in changing the face of the earth

that has caused the most massive extinctions."¹³ Our failure to steward creation will be discussed in more detail below.

The Dodo's Habitat and Discovery

The Dodo species group (formerly *Raphidae*) consisted of at least four similar flightless birds called "didine" birds that lived in similar, but different, habitats. These are the Dodo of Mauritius, the White Dodo, the Solitaire of Reunion, and the Rodriguez Solitaire. Both the Dodo of Mauritius and the White Dodo lived on Mauritius, a small island of 809 square miles located five hundred miles east of Madagascar in the Indian Ocean. The Solitaire of Reunion (once called Bourbon) lived on Reunion Island, and the Rodriguez Solitaire lived on tiny Rodriguez island.¹⁴ Mauritius, Reunion, and Rodriguez are a group of volcanic upthrust islands collectively called the Mascarenes, located between Madagascar and Australia. Other members of the Dodo family lived on widely separated, small, neighboring islands that stand alone in a water wilderness thousands of miles from any neighboring island or land.¹⁵

These birds evidently thrived in their island habitat.¹⁶ Like many small remote islands, the Mascarenes did not contain mammals, and the only vertebrates were a few reptiles and several kinds of birds. Among the many varieties of birds that lived there were parrots, crows, sparrows, owls, geese, ducks, and doves.¹⁷

The Mauritius Dodos were discovered in the early 1500s by the Portuguese and became extinct after a mere 174 years. The enormous slaughter during this brief time decimated this very "remarkable bird" that once "existed in considerable abundance."¹⁸ Contemporary accounts claim that sailors killed as many as fifty large birds a day, about half of which were Dodos.¹⁹ The Reunion Solitaire has been extinct since the end of the seventeenth century, and the Rodriguez Solitaire since the latter half of the eighteenth century.

Since many drawings were completed from live specimens, and travelers' accounts substantially agree on its physical traits, a good understanding of this species' physiology can now be determined (see Figure 1).

The major differences in descriptions of the Solitaire pertain to its color, which probably reflects actual color variations in the wild. The Rodriguez Solitaire was a "delightfully beautiful" bird and also "delightfully edible" according to contemporary accounts.²⁰

Evidence for Dodo Evolution

No account of the Dodo is complete without an attempt to understand the Dodo's origins and its relationship with other birds. Unfortunately, the "evolutionary history of the Dodo is very poorly understood."²¹ Because the evolution of the Dodo can only be speculated, this topic has been a subject of much controversy for decades.²² One major reason is because a complete lack of transitional forms exists, and no evidence of its evolution has been discovered thus far in the fossil record.²³

Some claim that one reason for this may be that the thin bones of birds are often poorly preserved. Others note, as a comparatively heavy, nonflying bird, the Dodo's bones were thicker than those of most birds and would have had a better chance of becoming fossilized than the bones of most birds. Actually, a large number of bird fossils exist, and bird bones are often preserved quite well, including Dodo bones.²⁴ Many examples of good preservation of bones from large birds, such as giant moa (200 kg body mass), to small birds, such as wrens (10 g body mass) exist.²⁵ Depositional environment is, as a whole, far more important than bone thickness. Fortunately, many complete Mauritius Dodo skeletons exist (mostly assembled from bones found in the late 1800s) that help us under-

stand Dodo anatomy. Also, a large number of bone fragments of the Solitaire Dodo exist, but unfortunately, no bones exist for the White Dodo, which is known only by drawings made by contemporary travelers.

It is assumed that Dodos evolved from hypothetical large, tooth-billed pigeons whose ancestors flew to the Mascarenes.²⁶ Dodos are also speculated to have lost the ability to fly because their new homeland lacked enemies and had plenty of food that did not require flight to obtain.²⁷ Fuller concluded that the evolution from pigeon to Dodo may have taken place "quite rapidly" (and thus, left no fossil record), even though the "visual differences between a Dodo and the familiar pigeon species are immediately apparent and a vast gulf seems to lie between them."²⁸

Kitchener concludes that Dodos "probably evolved from African fruit pigeons of the genus *Treron* which became stranded on the blissfully predator-free island of Mauritius."²⁹ Whitlock speculates that Dodos are related to pigeons (or perhaps rails) and now are usually classified as members of the pigeon family.³⁰ Shapiro, et al. conclude that "the Dodo has been linked with avian groups ranging from the ratites to the raptors." Furthermore, morphological studies have linked the Dodo "and its presumed close relative the solitaire (*Pezophaps solitaria*) with the Columbiformes (pigeons and doves), but their exact position is unresolved and they have been placed in many positions within the cosmopolitan *Columbidae* or in their own family, *Raphidae*, outside the *Columbidae* but within *Columbiformes*."³¹

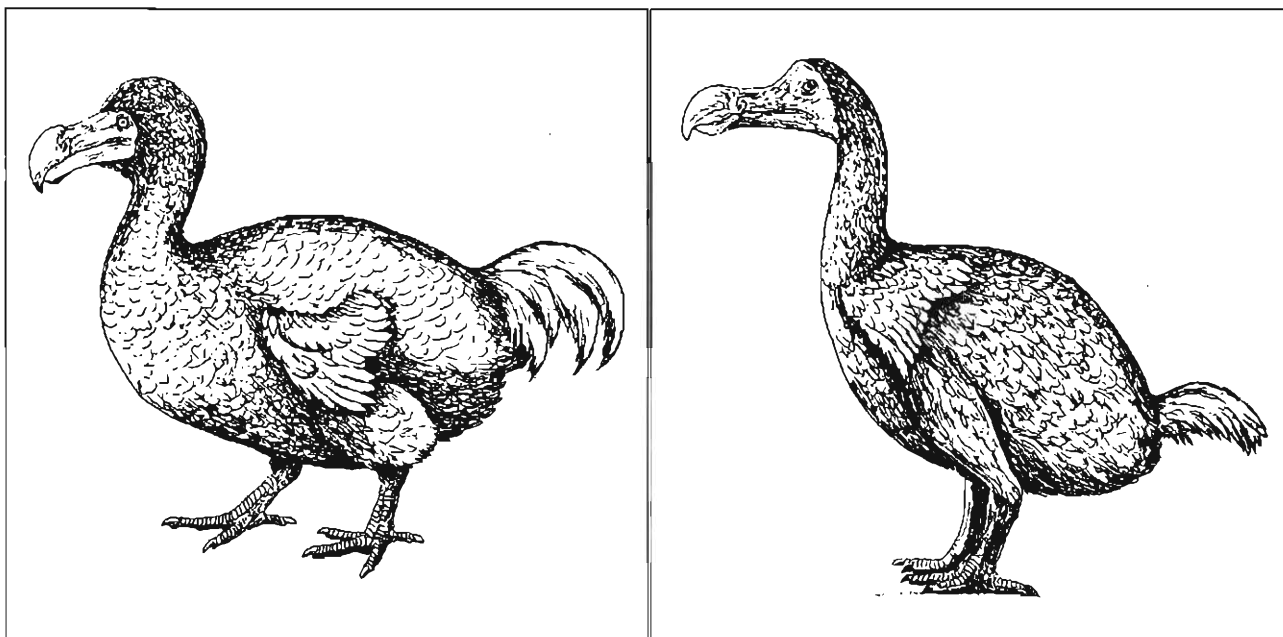
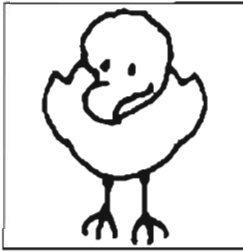


Figure 1. Artist rendering of the older view (left) of the Dodo compared to the newer view (right) that resulted from the work of Kitchener and others. Note that the primary difference is that in the newer view the Dodo is thinner. Drawing by artist Richard Geer, East Lansing, MI.



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Classification is made more difficult by the fact that a study of its feathers has shown that it had unique traits not found in "any other bird."³² The DNA evidence evaluated so far indicates they are part of the order *Columbidae*.³³

Other scientists have argued that the Dodo, which was once called a "gentle dove," was an evolutionary link that "was of considerable importance."³⁴ Livezey even concludes that, in spite of their extinction, both *R. cucullatus* and *P. solitaria* were "evolutionarily innovative in ontogeny, morphological characters and life-history strategies."³⁵ No fossil evidence for any of these theories of its evolutionary origins has ever been discovered, even though we have uncovered hundreds of fossilized Dodo bones.³⁶

Modern Reexamination of the Dodo

The bird's putative obesity, slowness, lack of intelligence, and inability to fly are all commonly used as reasons for its alleged evolutionary inferiority.³⁷ Dodos were believed to be not only large, but also grossly overweight to the point that they could not fly. Consequently, they lost their flight ability and could not escape from their ground enemies. A careful recent reexamination of the Dodo has revealed that many of the common negative perceptions about the bird (such as its obesity) are probably incorrect.³⁸ In the words of Maddox, "The Dodo deserves a better press."³⁹ Specifically, recent studies, such as those by Livezey on 387 Dodo skeletal fragments and by Kitchener at the Royal Museum of Scotland, have radically changed our view about the bird's size and behavior.⁴⁰ The latter work has questioned the role of the bird in evolutionary history. Kitchener writes:

Rivaling the dinosaurs as a symbol of extinction, the Dodo is renown for being slow, stupid and fat. An evolutionary disaster, *Raphus cucullatus* was doomed to extinction from the day it was discovered by hungry Dutch sailors in the forest of Mauritius in 1589. Wasn't it? Maybe not.⁴¹

Kitchener's work is based on detailed study of the many bones unearthed, as well as the extant dried head specimens. His major finding is that the Dodo was much

thinner and sleeker than previously believed. Many of our modern conclusions about the Dodo's appearance were based on seventeenth-century oil paintings of overweight, under-exercised birds—a condition that usually resulted from their being kept as pets by wealthy Europeans who fed them a high-fat diet.⁴² Pet Dodos often ballooned up to almost twice what they would have weighed in the wild. At their normal thirty pounds, they were good-sized birds but not much heavier than a comparably sized bird, such as a swan.

After studying the Dodo's history, Kitchener found that the *earliest* Dodo drawings showed rather thin birds—and only those paintings completed later display the familiar pudgy variety.⁴³ Over a dozen original pictures (both drawings and paintings) of the Dodo now exist.⁴⁴ Kitchener further found that while the thin Dodos were drawn by those who actually had visited Mauritius, the plump portraits were produced mostly by artists working in Europe. This factor supports the conclusion that the Dodos brought to Europe were fattened by their owners.

Kitchener next evaluated the hundreds of Dodo bones that have been unearthed so far. Using the methods developed by criminologists and archeologists to reconstruct flesh on bones, he was able to determine that the skeletal pattern produced a bird "remarkably similar" to the *early* drawings of the Dodo—i.e., thinner, far less obese birds. Kitchener concluded from his work that the actual weight of the wild adult Dodo was probably between 11 to 17 kilograms.⁴⁵ This is close to the weight of a male great bustard, the heaviest flying living bird. Even an obese Dodo, Kitchener estimated, would weigh only 21.7 to 27.8 kilograms. This number compares closely with the only published record of a Dodo body weight that he could locate, a 1634 estimate of 23 kilograms (50 pounds), which may represent the bird's upper limit. Males weighed about four kilograms more than females (Dodos were more sexually dimorphic in terms of size than most birds).

An evaluation of eggshells also can be used to produce a body weight index, because the mass of the eggshell varies in proportion to the mass of the bird that lays it. No confirmed surviving Dodo bird egg exists, but from descriptions of their eggs in

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literature, Kitchener was able to estimate the Dodo's weight at about 13.7 kilograms—the same value that he obtained from an analysis of the relationship between the length of the leg bone and other bone measurements.⁴⁶ Using both bones and research on living birds, Kitchener demonstrated that a bird's skeleton accounts for a fixed proportion of its body weight. The leg-bone analysis method is based on a direct relationship between leg-bone dimensions and the weight that the bone must carry, a relationship that holds for every size of bird from a hummingbird to an ostrich.⁴⁷

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Kitchener concluded that “according to four different methods, all based on the Dodo's bones, the famous flightless pigeon weighed between 10.6 and 17.5 kilograms.”⁴⁸ His conclusion may be an underestimate, but it still supports the lower values for weight. These estimates held up, even when he compared bone-body weight ratios of flying and nonflying birds, such as that of a flightless kakapo, the world's largest parrot.

Evaluation of the cantilever strength of leg bones produces a relationship that can be used to determine the running abilities of different-size animals. This method provided evidence that Dodos were indeed “swift of foot”—a conclusion that corresponds with eyewitness accounts stating that the Dodo “could run very fast” (quoted in Kitchener⁴⁹). While Kitchener's analysis is not without problems, his conclusions are very reasonable, especially in view of the fact that the opposite thesis has little empirical evidence in its favor. One problem in obtaining weight estimates is that the Dodo deposition of body fat varied greatly by season, and considerable intra-generic and intergeneric diversity in body mass existed.⁵⁰

Since Kitchener's first evaluation, original unpublished Dodo drawings from the early 1600s were rediscovered in a Hague, Netherlands museum that support his revisionism conclusions. The Dodos in the drawings are thinner

than those in European paintings, and the femur was tilted downward, reducing the bending forces on it and allowing it to rapidly shift its center of gravity.⁵¹ This evidence demonstrates that the Dodo was an effective, fast runner. Kitchener concludes:

[for over] 350 years the Dodo has been thoroughly misrepresented as plump and immobile. The reality is, however, that in the forests of Mauritius it was lithe and active. Like other Mauritian birds it would have undergone a seasonal fat cycle to overcome shortages of food, but never to the extent that those wonderful oil paintings suggest.⁵²

Several other studies have also confirmed Kitchener's results. Livezey examined 387 skeletal elements and concluded that the body mass of the Dodo was 21 kg for males and 17 kg for females.⁵³ Lindstedt and Calder estimated the mass for the Dodo at 15 kg and 17 kg for the solitaire.⁵⁴

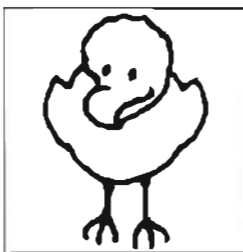
Even minor details that gave the birds a “stupid” look, in harmony with their historical image, are being modified with our new understanding. For example, its tail, often shown as a sparse collection of feathers located rather high on the bird's back, likely was much fuller and far more dignified. The existing reconstructions, which Edwards states have caused the bird to look “sedately amusing” and produced “vast amusement” for observers,⁵⁵ may now all have to be reexamined.

The Mauritius Dodo's bill was as long as nine inches, and was prominently hooked downward at the tip. The beak and the area up to and behind the eyes lacked plumage, the feet and legs were yellow, and the skin was light ash in color. Furthermore, a 1634 account stated their irises were a whitish color; their eyes were round, small, and bright as diamonds; and their covering was of the “finest downe” (quoted in Gosse⁵⁶). The Dodos also ate “stones” that their gizzards used to crush food.⁵⁷ Their diet consisted of plants—most likely seeds, fruit, and foliage.⁵⁸

Human Mistreatment of Dodo Birds

The earliest accounts of the Dodos by the Dutch navigator, Admiral Jacob Corneliszoon van Neck, date from 1598. The Dodos were first found on an island he named Mauritius in honor of his patron, Prince Maurice of Nassau, ruler of the Netherlands.⁵⁹ Since Arab ships sailed the Indian Ocean as early as the Middle Ages, it is quite likely that they were aware of the bird but left no known written records. The other two islands on which Dodos lived, Reunion and Rodriguez, lacked names in the 1500s or had names that we have not yet associated with these islands, making it difficult to relate early accounts of Dodos to specific islands.

Admiral Jacob extensively described the island's abundant ebony tree forests and exotic wildlife. He also discussed the Dodos in some detail, claiming that they were



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quite unlike any other bird with which he was familiar. He concluded that, having no predators, the birds did not fear humans, which is one reason why they were thought stupid—just as sheep are so easily led to slaughter and are thought stupid. It was reasoned that an intelligent animal would perceive its fate and struggle to escape death.

When the soldiers encountered chicks, though, the birds pecked “mighty hard.”⁶⁰ Adult Dodos could also bite hard with their “remarkably strong” bill and run fast with their strong legs.⁶¹ The crew killed many of the birds and soon found that, although their flesh was tough and bitter, the longer the Dodos were cooked, the more palatable the flesh became. They also took home a pair of adults, one of which ended up in the Netherlands. The birds were a sensation in Europe and were described in a fair amount of detail in numerous contemporary accounts. These records were critical in Kitchener’s reassessment of the bird.

Emperor Rudolph of Germany also purchased a Dodo and soon had its portrait painted. Pictures of the birds rapidly circulated throughout Europe, and the demand for them was evidently so great that ships soon began bringing Dodos back to Europe for sale to the wealthy or to naturalists.⁶² Dodos were also shipped to India, Java, and Japan.⁶³ Many died en route, and only about a dozen reached Europe alive before they became extinct.⁶⁴ The original Netherlands bird was honored with fourteen oil and watercolor portraits before it died. The Dodos were excellent subjects for portraits—once posed, they remained virtually motionless until the picture was completed.

Unfortunately, these paintings cannot be relied upon exclusively, because artists took “considerable anatomical license,” some making the birds’ hooked beaks “more fearsome” and turning “their forked dovelike feet into the webbed toes of a duck.”⁶⁵ Nonetheless, enough paintings of the Dodo exist to provide clear evidence to help us piece together a reasonably accurate picture of them.

Since the birds were easy to capture, within a short time the Dutch colonists (along with sailors and visitors) soon killed most of the Dodo population. Most sailors

spent months at a time at sea and, confined to meager rations on the ship and, no doubt relished their sojourn to a set of islands that contained fresh meat.⁶⁶ Fresh meat was also important for sailors to reduce the problem of scurvy, a concern until it was discovered fresh fruit such as lemons could treat the problem. The animals that the sailors brought with them, especially dogs, cats, monkeys, farm hogs, and the inevitable rat, ate the fledglings and broke the Dodo eggs open to consume the yolks. By about 1690, the Mauritius Dodo was extinct, and the White Dodo became extinct in about 1770 (see Roberts and Solow for a discussion of the problem of determining extinction⁶⁷). Actually, despite the unceasing slaughter of wildlife carried out “by the hundreds of European ships that visited Mauritius, the Dodo survived for generations.”⁶⁸

It was only when the colonists “displayed a grim dedication to the cause of exterminating the Dodo” that their demise was sealed. According to Panati, “Not a single naturalist had attempted to mate any of the captive Dodos; they left no descendants.”⁶⁹ The sailors would arrive at the island, not caring if a breeding stock remained, because most were not animal connoisseurs and few had any plans to return anyway. Even if a ship’s crew ensured that breeding stock remained, the next shipload of sailors often would have nullified their forethought. Furthermore, many persons then did not consider the total extinction of any animal type a possibility.⁷⁰ Rather than demonstrate their weakness, the history of the Dodos effectively argues for the gross irresponsibility and even viciousness of their caretakers.⁷¹

Kitchener argues that it was not the Dodo’s physical inferiority that caused its extinction, but the “rats, pigs, and monkeys that arrived with the sailors and pillaged the Dodo’s vulnerable ground nests.”⁷² Smith concludes they became extinct not because of natural selection, but due to “direct predation—as is true of probably all recent cases of extinction by man.”⁷³

The extinction of a fat, slow, inferior, defenseless Dodo argued for Darwinism far more effectively than similarly threatened, better-adapted birds that were saved only through the heroic and deliberate efforts of a large number of concerned individuals.

Now that the bird has been extensively studied, we realize it did not support the myth but instead eloquently supported the human callousness.⁷⁴ Not only did the Dodo become extinct on the Mascarene Islands, but Day⁷⁵ claims that “countless pathetic slaughters wiped out tortoises, gray parrots, blue pigeons and many other birds and reptiles” that once thrived there in peace. In the words of Livezey:

[the view that] *R. cucullatus* and (to a lesser degree) *P. solitaria* represent aberrant, overly specialized, degenerate, evolutionary oddities is misleading. The comparatively brief, largely anagenetic and ecogeographically limited morphological trends manifest in *R. cucullatus* and *P. solitaria* render moot the question of “evolutionary progress” by most accepted criteria.⁷⁶

Gould concludes that to argue that the Dodo became extinct because it was inferior is to blame the victim. He compares the situation to the native Bohemians who also became extinct at the hands of their Spanish conquerors. He regards claims that, as a primitive savage race, “they were doomed by their own inherent inferiority is racist in the extreme.”⁷⁷ As Gould concludes, victory does not inevitably go to the brave, the strong, or the smart, but time and chance “happens to them all.”⁷⁸ Likewise, as this paper argues, it is clear that human irresponsibility was the reason for the Dodo’s demise, not their supposed inferiority.

The Dodo Myth

When English naturalist John Tradescant died in 1662, his entire nature collection including his Dodo’s was bequeathed to an acquaintance, Elias Ashmole.⁷⁹ Due to his irresponsibility and the poor preservation methods used then, the entire collection’s condition soon deteriorated. Two years after the last living Dodo was seen on Mauritius, Elias donated his mounted Dodo to Oxford University in 1683. Even Oxford did not take very good care of the bird, and except for the head and foot that were saved by a foresighted curator, it was burned as trash in 1755.⁸⁰ Evidently, the museum’s board of directors “took one look at the dusty, stupid-looking bird and unanimously voted to discard it.”⁸¹

Many people did not share the opinion of Oxford University. Interest in the bird was such that, by 1800, “professional naturalists were casting doubt on written descriptions of the bird, as well as on extant drawings.” It even became in vogue scientifically “to deny the bird’s existence and to challenge the Oxford head and foot as fakes.”⁸² If it was a genuine bird, the critics reasoned, certainly there would have been extensive systematic efforts to preserve it—or at least to save a good skeleton. A group of zoologists that searched Mauritius in 1850 looking for bones found none. Soon the Dodo was denounced as a “scientific fraud.”⁸³

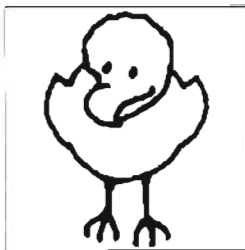
Evidence for its existence did not surface until a resident of Mauritius, George Clark, extensively searched the island and eventually discovered numerous scattered bones. His bone specimens were soon shipped to major museums and, after extensive study, they were pronounced authentic. These researchers later attempted to assemble the bone fragments (many of which were in poor condition) into complete Dodo skeletons. The Dodos are now recognized as real animals, but the many other myths surrounding them died slowly.⁸⁴

A group of zoologists that searched Mauritius in 1850 looking for bones found none. Soon the Dodo was denounced as a “scientific fraud.” ... The Dodos are now recognized as real animals, but the many other myths surrounding them died slowly.

Summary and Implications for Christianity

Human-caused animal extinction almost always has little to do with direct competition for food, and extinction in the long run causes loss of food supplies and resources for humans. Humans now have the ability to cause most all life to become extinct by virtue of their knowledge of such tools as poisons, guns, and atomic bombs. This has nothing to do with survival of the fittest or natural selection in the Darwinian sense. Eldredge states that “predators generally do not hunt their prey into oblivion,”⁸⁵ as humans have often done.

Humans are increasingly taking over land that was once dominated by animals, but as ecologists stress, this need not cause their extinction. Only if larger numbers of humans wantonly disregard the welfare of the animals living in an area and refuse cooperation with conservationists will this happen. Selfishness, shortsightedness, greed, and lack of planning have caused most recent animal extinctions—not direct human competition with animals in the Darwinian sense. This is supported by the fact that “very many of our game birds, shore birds, and waterfowl, would today be extinct, or near extinction, were it not for coddling through refuges and protective laws.”⁸⁶



Article

The History of the Dodo Bird and the Cause of Its Extinction

The role of natural selection in history ... seems to be primarily to reduce the rate of the accumulation of harmful mutations, often called devolution, and not the role that Darwin ascribed to it.

The comparison of the Dodo, which appeared to be inferior, and other birds which became extinct, such as the passenger pigeon (which was clearly superior as judged by the evolutionary naturalists of the day), helps us to better assess the role of natural selection in history. Its role seems to be primarily to reduce the rate of the accumulation of harmful mutations, often called devolution, and not the role that Darwin ascribed to it. The Dodo example also supports Raup's conclusion from his extensive study of the cause of extinction, namely that bad luck is by far more important than bad genes.⁸⁷ Most animals that have become extinct are not in any clear way inferior than those still around today but (in most cases) were the victim of circumstances, chance, and the irresponsibility of humans.

The Dodo case fits Raup's observations and is a lesson in irresponsible Christian stewardship of the Earth's limited resources.⁸⁸ All the Abrahamic religions (Judaism, Christianity, and Islam) teach the environmental ethic which supports the "belief in the holiness of the Earth and the perception of nature as God's handiwork" that must be cared for and maintained.⁸⁹ As far back as the thirteenth century, Saint Francis of Assisi "prayed for the welfare of God's creatures" and extolled the "beautiful relationship" of humankind and nature by humans.⁹⁰

In Gen. 1:28, God instructs Adam and Eve to "fill the earth, and subdue it, and rule over the fishes of the sea, and the birds of the air, and all living creatures that move upon the earth." Some have construed this passage as permission to exploit nature exclusively for human needs. As Wilson notes though, it is now "more commonly interpreted" to refer to a command by God for humans to be "stewardship of nature."⁹¹ He adds:

Pope John Paul II has affirmed that "the ecological crisis is a moral issue." And Patriarch Bartholomew I, spiritual leader of the world's 250 million Orthodox Christians, has declared, in the clarion tones of an Old Testament prophet, that "for humans to cause species to become extinct and to destroy the biological diversity of God's creation, for humans to degrade the integrity of the earth by causing changes in its climate, by stripping

the earth of its natural forests, or destroying its wetlands, for humans to contaminate the earth's waters, its land, its air and its life with poisonous substances, these are sins."⁹²

Many evangelical denominations and sects, even those that teach a literal interpretation of the Bible, support this view. Wilson cites Stan L. LeQuire, director of the Evangelical Environmental Network, who stated the issue very incisively:

"We evangelicals are recognizing more and more that environmental issues ... really come from the most wonderful teachings that we have in Scripture, which commend us to honor God by caring for creation." His network, organized into "Noah Congregations," proved its mettle: it contributed \$1 million to the successful campaign against congressional efforts to weaken the Endangered Species Act.⁹³

The loss of the Dodo is only one of many stirring reminders of the need for this Christian environmental ethic today. ♦

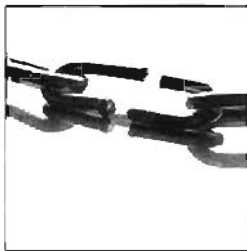
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Article

From Gaps to God

From Gaps to God

Randy Isaac



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*In this article,
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Arguments for the existence of God that are based on design often specify an aspect of our natural world that cannot be explained by our current understanding of the laws of nature. Such a gap of knowledge is construed as evidence for the existence of a supernatural being.¹ Critics of this approach label these arguments as "God-of-the-gaps" fallacies that diminish the case for a Creator God as the gaps are filled in with increasing knowledge.² Confident that all such gaps will some day be filled via the scientific method, many people reject design arguments for God. However, gaps of knowledge do exist in nature and the scientific community acknowledges that many cannot be filled, even in principle. This article surveys various types of gaps and considers their role in an argument for God.

In this article, we will address only naturalistic knowledge rather than spiritual or revealed knowledge, not because the latter is not real or important but because we wish to explore whether the limits of naturalistic knowledge might reveal the existence of the supernatural. The set of all possible naturalistic knowledge can be considered to have two primary subsets: that which is known K , and that which is unknown U .

Set U can be further divided into two subsets. The first subset U_k is that which we know we do not know but which is knowable—the unknown but knowable. A scientific project begins by identifying an area of interest in set U_k . A successful project produces new knowledge that, upon peer review and evidence of reproducibility, becomes accepted by the scientific community as an element of set K . The best research projects also result in the identification of additional relevant areas of U_k . The second set U_u comprises that which we know we do not know and which is unknowable within the context of methodological naturalism.

Controversies surrounding "God of the gaps" arguments typically focus on whether

an element is in set U_u or in set U_k . An argument for the existence of God that is based on a claim that the explanation of a phenomenon is a member of set U_u is often refuted by a counterclaim that it is in fact a member of U_k and will eventually move to set K . Until it does become a member of K , it is not always easy to determine whether an element is a member of U_u or of U_k .

The scientific community does acknowledge that set U_u is not an empty set. This article addresses six types of gaps of knowledge and discusses the implications.

1. Statistical

The first category is that which is unknowable due to scope and therefore is knowable only on a statistical basis. Avogadro's number of atoms or molecules in a mole of substance, 6×10^{23} , is so inconceivably vast that there is no hope of knowing the attributes of each molecule in even a minute but macroscopic amount of substance. Nevertheless, statistical methods and statistical distributions such as Gaussian and Boltzmann distributions enable us to determine attributes such as pressure, temperature, velocity, etc.

From a classical mechanics perspective, the individual attributes of each molecule are knowable in principle, making this a member of set U_k rather than U_u but in practical terms it will always be unknowable. Practical unknowability, as opposed to unknowability in principle, is usually a result of the limits of the tools we have at our disposal. The ability to store and manipulate vast amounts of data with affordable computers

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has made it practical to generate knowledge previously considered unattainable. Unknowability in principle means that our knowledge is not limited by tools but by fundamental concepts. In this example, we have tools that can measure the attributes of aggregate molecules but are limited in making such measurements of each molecule in a mole of substance.

2. Chaos

The second type is that which is unknowable due to precision and sensitivity. Chaos theory, whose beginnings can be traced to 1960 by Edward Lorenz,³ tells us that many everyday phenomena have an exceedingly high sensitivity to initial conditions, well beyond any precision that we can bring to its measurement. Classical systems of equations can be shown to lead to random behavior while random behavior can often be found to have an orderly basis. Despite the growing precision of our measurements, this sensitivity will always exceed our abilities.⁴ Thus this portion of set U_u may shrink but will never disappear.

3. Quantum Effects

The advent of quantum mechanics in the 1920s opened up a pervasive realm of unknowability in sharp contrast to the confidence of Newtonian mechanics that proclaimed ultimate knowability of all motion. Four types of quantum unknowability are worth exploring in more detail.

A. Uncertainty Principle. Heisenberg articulated the uncertainty principle, or principle of indeterminacy, in 1927.⁵ Mathematically, the two relevant relations are:

$$\Delta p \Delta q \geq h/4\pi$$

$$\Delta E \Delta t \geq h/4\pi$$

where p is the momentum, q is the position, E is energy, t is time, and h is Planck's constant, 6.6×10^{-34} m²kg/s. Philosophically, Heisenberg realized the implications were enormous. Since momentum and position cannot be simultaneously known, equations of motion cannot have sufficiently accurate input to trace the behavior of the world. The vision of a predictable and knowable world was shattered. For nearly eight decades, the scientific community has acknowledged this inherent limitation of knowledge, making it a clear component of U_u .

B. Quantum States. In contrast to classical mechanics where particles are tracked through space-time in a predictable trajectory, quantum mechanics describes particles in terms of amplitudes of wave functions, the square of which represents the probability that the particle has that particular value. We can know only the probability that a particle has a particular value of some attribute. Furthermore, the measured state of a particle depends on the measurement being done. Knowledge of a particle is therefore statistical in nature but substantively different from the statistical knowledge discussed earlier. Here the statistical aspect is inherent and not simply a limit of our ability to comprehend the vast scope of nature. Attributes of particles and

the prediction of events or motion can only be known statistically. For some authors like Kenneth Miller⁶ and Robert John Russell,⁷ this provides God the opportunity to carry out his providential will without naturalistic detection.

C. Radioactivity. Radioactivity deserves special mention. It is the result of quantum behavior of the weak force that binds nucleons. The rate of radioactive decay of unstable nuclei can be determined with great accuracy but there is no way, even in principle, to predict the moment of decay of any given atom. This unknowability places radioactivity for individual atoms in the set U_u .

D. The EPR Paradox. The Einstein-Podolsky-Rosen paradox was part of Einstein's critique of quantum mechanics.⁸ Two entangled particles that are described by a single coherent wave function retain correlated attributes even after traveling a significant distance apart, until the coherence is broken. When measurements are made of these particles, the particles are still correlated. Such "spooky action at a distance," as Einstein ridiculed the result, has been confirmed experimentally but is not at all understood. Whether this is an element of U_u or U_k is yet to be determined.

4. Indistinguishability

Some attributes of particles are unknowable due to the nature of elementary particles. Each particle may be characterized by a set of attributes such as spin, baryon number, energy, etc. but these are not unique and two particles with the same attributes are indistinguishable. Elementary particles, molecules, or any small combination of particles are indistinguishable from each other.

Distinguishability arises only when the number of states at equilibrium exceeds the population. For example, the hydrogen atom has a single ground state, though with various angular momentum orientations, while the number of hydrogen atoms in the universe is more than 10^{50} . The population of hydrogen atoms far exceeds the number of states at equilibrium and these atoms are all indistinguishable. In sharp contrast, a snowflake contains about 10^{20} identical water molecules which can be configured in so many ways that the number of possible states of a snowflake far exceeds the total number of snowflakes which may be on the order of only 10^{24} /year. The population of snowflakes is so much smaller than the possible number of states that the probability of two snowflakes being identical is vanishingly small.

We can also describe differentiation in terms of entropy S which is defined as $S = k \ln N$ where k is Boltzmann's constant 1.38×10^{-23} Joules/Kelvin, and N is the number of states at equilibrium. Unique differentiation of members of a population is possible only when the entropy is high and the size of the population is relatively low.

Individual identity of any substance or being is therefore rooted not in the uniqueness of one's constituent



Article

From Gaps to God

The fallacy of the "God of the gaps" arguments is ... that gaps do not point us to a Creator God. ... The mystery of why our universe is understandable at all may be the ultimate gap that leads us to God. Naturalistic knowledge leads us to infer the existence of the supernatural Creator ... because of the very possibility of such knowledge.

components but in their structure and dynamic relationship. A substance can be reconstructed or a being can be resurrected by recreating the same configuration without necessarily using the same components.

Distinguishability of elementary, atomic, and molecular particles is clearly in the set U_u . Does God know the identity of each particle? We can only speculate but the answer would have no apparent significance for us.

The age of any substance is the time since its formation. Unless an independent observer records the moment of formation and tracks the identity of that substance over time, age can be inferred only by a known rate of change of any attribute. No elementary particle or simple atom or molecule has any characteristic in the ground state that changes over time. Only agglomerations of particles large enough to have distinguishing features that change over time can have a useful attribute of age. Only God knows the age of an elementary particle while for us such information remains in the set U_u .

5. Cosmology

Considering the vast reaches of space and time, it is amazing that we have learned as much as we have about the origin and evolution of our universe. In recent years, cosmologists have been particularly successful in learning just how much we do not know. At present, there seems to be evidence that only 5% of the mass in the universe can be attributed to normal matter. Another 25% appears to be dark matter and about 70% is dark energy. Dark matter is not just matter that we cannot see but is matter that cannot be attributed to any particles that we know. Its source is a mystery. Dark energy may be equivalent to the cosmological constant that Einstein included in his original general theory of relativity before withdrawing it.⁹ Are dark matter and dark energy part of set U_u or of U_k ? If knowability is defined solely within the context of forces and particles and laws of nature that we know today, the answer must be U_u . Scientists continue to hold out hope that new dimensions of reality may be discovered that would enable us to consider the origins of dark matter and dark energy to be knowable. Two of the current approaches being debated are loop quantum gravity¹⁰ and M-theory, a superset of five types of string theory.¹¹ The former is based

on the quantization of both space and time while the latter is based on seven additional spatial dimensions beyond our four space-time dimensions. In any case, it is clear that the origin of our universe and of our planet cannot be understood within the context of the current "standard model."

The formation and development of the universe is critically dependent on the value of many physical constants such as the strength of the gravitational and nuclear forces, the fine-structure constant, the speed of light, etc. Although we can measure these parameters, we do not know fundamentally why they have the values they do. Very small changes in any one of these parameters would prevent the universe from developing a planet hospitable for life as we know it. This has led to the anthropic principle, arguing that a designer must have tuned these constants to enable human life.¹² We do not know whether someday a "theory of everything" will be developed from which we can derive the values of all these constants. For now, the reason they have these values is unknown.

6. Biology

Three major unknown areas in biology are the origin of life, the origin of species, and the origin of mind. Darwin's theory of evolution is a fruitful, though yet incomplete in detail, explanation of the origin of species but no widely accepted explanation exists for the origin of life or of mind. Most intelligent design theories proposed today are based on claims that the naturalistic origin of life and of mind is so improbable that it must be in the set U_u and that it is more probable that an intelligent designer is the direct causal agent. Behe points to the apparent irreducible complexity of biomolecules such as hemoglobin and flagella as evidence that their development is not knowable in the context of evolution.¹³ Miller¹⁴ counters with possible scenarios whereby those biomolecules could have evolved. Mills¹⁵ objects that Miller hasn't proven that these evolutionary pathways were actually used. Mills misses the point. The actual pathway may not be proven but there is no basis to concede to Behe and Mills that it is unknowable when plausible paths of formation can be defined. Until an element becomes part of set K , it cannot be determined with certainty whether it was in subset U_k or U_u . Proof that a phe-

nomenon belongs in U_u requires evidence that it cannot be known, not merely that current explanations are inadequate.

Dembski claims that information theory proves that the complex structures underlying life and mind could not have arisen from natural means.¹⁶ Exploring notions of complex specificity and specific complexity, he argues that random processes cannot generate specified complex systems. As Ruse points out, this is a false dilemma and does not provide compelling evidence that the origin of life is unknowable.¹⁷

The exquisite beauty and elegance of the portion of the universe that we can explain ... overwhelmingly display the power and glory of God to everyone ...

Improbability arguments are also frequently put forward to insist that origins of life and mind must be in the set U_u rather than U_k .¹⁸ It is certainly possible to show that the probability of certain events is low enough to assert that they will never occur in the duration of our universe. In reference to past events, however, these calculations merely show that the physical processes and assumptions used in calculating the probability are most likely incorrect rather than demonstrating that the explanation of the phenomenon belongs in set U_u .

Other areas could be discussed such as Gödel's theorem and other areas of mathematics where knowledge can be shown to be inherently limited. Gaps of knowledge do exist, not just because of our limited perception but inherent gaps that the scientific community accepts as unknowable. Most of the gaps cited above, particularly the first four categories, relate to descriptive attributes of matter rather than causal factors. Although God may (or may not) have supernatural knowledge of such attributes, our inability to close these gaps is not generally used to justify the existence of a divine creator. There is no compelling reason to believe that there must exist a being that possesses such knowledge. In cosmology and biology, and to some extent in quantum uncertainty, the gaps tend to concern explanations of phenomena or explanations of why an attribute has a particular value. These gaps are the ones generally used to point to a creator. However, there is no fundamental reason why a gap must be filled, whether by naturalistic means or otherwise.

The fallacy of the "God of the gaps" arguments is not that these gaps may someday all be closed¹⁹ but that gaps do not point us to a Creator God. The strongest argument for the existence of God is indeed a design argument, one that is based on our set of knowledge K rather than U_u .²⁰

The mystery of why our universe is understandable at all may be the ultimate gap that leads us to God. Such an argument is not a logical, irrefutable scientific proof but rather a display of God's handiwork to those who "believe that he exists and that he rewards those who earnestly seek him."²¹ Naturalistic knowledge leads us to infer the existence of the supernatural Creator not because of its inherent limitations but because of the very possibility of such knowledge. The exquisite beauty and elegance of the portion of the universe that we *can* explain, whether by simple observation or by Maxwell's equations or Schrödinger's equations, overwhelmingly display the power and glory of God to everyone, not just to those who are expert enough to identify the elements of U_u . "For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse."²² ♦

Notes

¹For an early history of arguments from design, see R. Thornhill, "The Historical Relationship Between Darwinism and the Biological Design Argument," *Perspectives on Science and Christian Faith* (PSCF) 54 (2002): 249–59.

²D. F. Siemens, Jr., "On Moreland: Spurious Freedom, Mangled Science, Muddled Philosophy," *PSCF* 49 (1997): 196–9.

³E. N. Lorentz, "Deterministic Nonperiodic Flow," *Journal of Atmospheric Science* 20 (1963): 130–141.

⁴James Gleick, *Chaos* (New York: Penguin Books, 1988) is a very readable popular book on chaos theory.

⁵W. Heisenberg, "Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik," in *Zeitschrift für Physik* 43 (Berlin: Julius Springer, 1927), 172–98.

⁶K. Miller, *Finding Darwin's God* (New York: Harper-Collins Publishers, 1999).

⁷R. J. Russell, "Special Providence and Genetic Mutation: A New Defense of Theistic Evolution" in *Perspectives on an Evolving Creation*, ed. K. B. Miller (Grand Rapids: Eerdmans, 2003), 335–69.

⁸A. Einstein, B. Podolsky, and N. Rosen, *Physical Review* 47 (1935), 777.

⁹See, for example, R. P. Kirshner, *The Extravagant Universe: Exploding Stars, Dark Energy, and the Accelerating Cosmos* (Princeton University Press, 2002).

¹⁰L. Smolin, "Atoms of Space and Time," *Scientific American* 290 (January 2004): 66–75.

¹¹B. Greene, *The Elegant Universe* (New York: W. W. Norton & Company, 1999).

¹²W. J. Neidhart, "The Anthropic Principle: A Religious Response," *JASA* 36 (December 1984): 201–7.

¹³M. Behe, *Darwin's Black Box* (New York: Free Press, 1996).

¹⁴K. Miller, *Finding Darwin's God*, 129–64.

¹⁵G. C. Mills, "In Defense of Intelligent Design," *PSCF* 54 (December 2002): 260–3.

¹⁶W. A. Dembski, "Intelligent Design as a Theory of Information," *PSCF* 49 (1997): 180–90.

¹⁷M. Ruse, *Can a Darwinian be a Christian?* (Cambridge: Cambridge University Press, 2001), 120–2.

¹⁸See, for example, A. E. Wilder-Smith, *Man's Destiny, Man's Origins* (Wheaton, IL: Harold Shaw Publishers, 1968), 57–70.

¹⁹Snoke, for example, objects to the "anti-God-of-the-Gaps" position because it assumes "that the onward steady march of science explains and solves everything." D. Snoke, "In Favor of God-of-the-Gaps Reasoning," *PSCF* 53 (September 2001): 152–8.

²⁰See, for example, H. J. Van Till, "Creation: Intelligently Designed or Optimally Gifted" in *Theology Today* (1998).

²¹Hebrews 11:6b, New International Version.

²²Romans 1:20, New International Version.



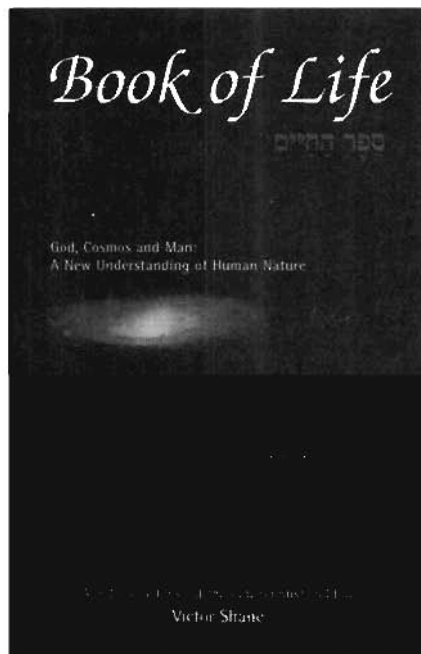
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Book of Life

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Victor Shane

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Most scientists will agree that the universe is moving from low to high probability (entropy) states, and that physical systems tend to move from low to high probability states as well.

History catalogs a similar tendency on the part of human institutions to move from ordered to disordered states. Can the evidence of history be reconciled with that of science to affirm the warnings of Scripture? Why does “evil” tend to get selected more often than “good?” Is it because it embodies a higher (more “natural”) probability state?

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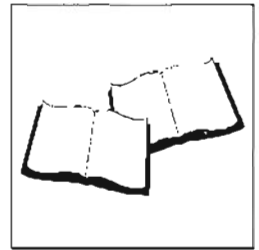
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The Two Books Prior to the Scientific Revolution

G. Tanzella-Nitti

The relationship between the revelation of God through nature and through Scripture is here studied,¹ by focusing on the metaphor of "the Two Books" as it was used from the Fathers of the Church up to the seventeenth century. According to the majority of the Fathers, the book of nature is as universal as the book of Scripture, and the content of each is to some extent equivalent. The authors of the Middle Ages emphasize that the capability of human reason to recognize God through the book of nature has been weakened by sin. Thus, it becomes necessary the reading of a "third" book, the book of the Cross. The work of Raymond Sebond plays an important role to understand the historical evolution the metaphor underwent during the Renaissance and the Modern Age. The autonomy of the book of nature with respect to the book of Scripture will increase accordingly, including the possibility to have access to an image of God different from that conveyed by sacred Scripture. The way in which the metaphor is used during the Renaissance will pave the way to deism in the eighteenth century and to naturalism in the nineteenth century.

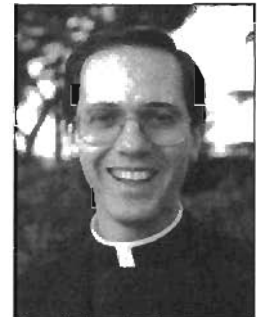
*Omnis mundi creatura
quasi librum et pictura
nobis est et speculum*

— Alan of Lille (twelfth century)
Hymn (PL 210, 579)

The contemporary debate between science and theology often speaks of a comparison between the "Book of Nature" and the "Book of Scripture." There are basically two ways in which this metaphor can be used. In the more general way, it refers to the comparison between the knowledge of nature achieved by science and the one we achieve reading the Judeo-Christian revelation, and thus understanding nature as creation. In this case, it is nothing but a different way of looking at the broad topic known as "Religion and Science." However, there is a second, and more intriguing way, to use it. We actually can refer to the term "book" in a specific and definite manner; that is, as a document written by someone and addressed to someone else; a document that is intended to convey an intelligible content; a text that might require a certain effort to be properly interpreted and explained according to its author's original and genuine meaning. But, we ask, how could this second way of understanding the metaphor be truly mean-

ingful? In fact, if it is clear to everyone what we mean when we speak of the book of Scripture, it might be less clear what we mean when we speak of the universe as a "book." It is obviously a metaphor, but its usage admits various degrees and nuances: up to what point are we allowed to consider nature a "book"? How was such a metaphor, that originated in a religious context, employed throughout history?

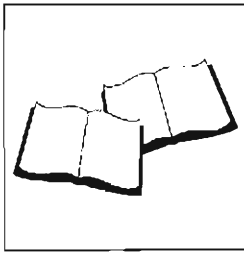
When speaking of the relationship between the two books, one first thinks to



Giuseppe Tanzella-Nitti

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Giuseppe Tanzella-Nitti received a university degree in astronomy at the University of Bologna (1977), and a doctorate in dogmatic theology, at the Pontifical University of the Holy Cross, Rome (1991). From 1981–1985 he was appointed astronomer of the Astronomical Observatory of Turin. Currently, he is professor of fundamental theology at the Pontificia Università della Santa Croce in Rome. He was the general editor of the Italian *Dizionario Interdisciplinare di Scienza e Fede*, a two-volume encyclopedia on religion and science published in 2002. He directs the web site "Documentazione interdisciplinare di Scienza e Fede" (www.disf.org). Research interests include theology of revelation and the dialogue between science and religion. His published books included several titles in Italian and English including *Questions in Science and Religious Belief* (Tucson: Pachart, 1992). He can be reached by e-mail: tanzella@usc.urbe.it



Article

The Two Books Prior to the Scientific Revolution

*From
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[Isa. 34:4;
Rev. 6:14]
are at least
inspiring
in this respect.*

what happened from the seventeenth century onward, that is, from the epoch in which the so-called "scientific revolution" began to question some relevant belief owned by the theological establishment. It was in that context when we began to speak of a "conflict" between the two books. Prior to that epoch, the use of the metaphor might seem less significant, and the whole subject lacking in interest. In reality, the image of the book had a wide literary usage well before the century of Galileo and Kepler.

In this paper, I will focus precisely on what happened before the scientific revolution and try to shed light on three major questions: (1) How were the "Two Books" mutually related and how was their content considered of some relevance to a better understanding of each other? (2) How did the leading philosophical ideas concerning the two books evolve through history? and (3) What epistemological consequences are entailed when we accept that nature is a real and true book? While the first two questions include a historical perspective, the third one appeals to contemporary philosophy of science.² However, a complete answer to this last question is beyond the aims of this paper. For this reason, I will confine myself to offer only a few hints about it, asking the reader to refer to the abundant literature existing on the topic.

Is Nature Seen as a "Book" through the Pages of the Holy Scripture?

It is well known that the Holy Scripture introduces the created world as an effect of the Word of God: "Then God said, 'Let there be light,' and there was light ..." (Gen. 1:3). This relationship between the world and the Word is strengthened in the New Testament, which affirms the dependence of the entire universe on the Word made flesh: "In these last days, he spoke to us through a son, whom he made heir of all things and through whom he created the universe ... and who sustains all things by his mighty word" (Heb. 1:2-3). With this biblical basis, theological and philosophical literature apply to the created universe metaphors which deal with the Word as such. By words we narrate a text, we pray hymns, or sing a song. Com-

paring the creatures to the letters of a book, or to the voices of a choir, is thus in accordance with a theology of creation centered on the Word-*Logos*. It is worth noting that when using other images, for instance, stating that natural things are like the footprint, the traces, or the mirror of God the Creator, such a link with the Word is less clear, or even absent. The metaphor of nature as a book, therefore, seems particularly consistent with a Christian theology of creation.

Turning our attention now to the way in which sacred Scriptures imagine or describe the aspect of the cosmos, especially the appearance of the sky, we first of all find the metaphor of a tent or a curtain. The heavens are spread out, or even stretched out, like a tent over the Earth, as we read in many passages from the Psalms and the books of Job and Isaiah.³ The verbs here used correspond (Heb. *natâ*) to the action of pitching and fixing a tent or, rarely, to the action of extending a cloth.⁴

In a limited number of cases, and in the apocalyptic context of God's final judgment, we find an interesting expression. We read in Isaiah: "The heavens shall be rolled up like a scroll, and all their host shall wither away. As the leaf wilts on the vine, or as the fig withers on the tree" (34:4). An almost parallel passage is presented in Revelation: "Then the sky was divided like a torn scroll curling up, and every mountain and island was moved from its place" (6:14). These passages seem to indicate that, within the metaphor of the stretched curtain, the curtain is like a scroll; so the action opposite to that of laying out (or also of creating) the heavens is that of curling or rolling them back, similar to a scroll. Since "scroll" is nothing but the name used by the Bible to indicate a book, we have perhaps some indication that the heavens may be seen as both a curtain and a scroll. These are stretched out when God lays out the heavens and will be rolled up, in future times, in a new creation. From a merely philological point of view, we do not have enough data to conclude that the Holy Scripture sees nature as a book, but the reading of some of these passages are at least inspiring in this respect.

It is also worth mentioning that in the Holy Scripture, particularly in Revelation (cf. Rev. 20:12), we find two more meta-

phors: the book of Life and the book of History. In chapter 5, we find the solemn vision of a mysterious scroll which had writing on both sides, that is outside and inside (cf. Rev. 5:1; cf. also Ezek. 2:9). An angel then proclaims in a loud voice: "Who is worthy to open the scroll and break its seals?" (Rev. 5:2). After the Lamb of God appears and receives this mysterious scroll from the hand of the Most High who sits on the throne, the angels and the elders finally cry out in a loud voice: "Worthy is the Lamb that was slain to receive power and riches, wisdom and strength, honor and glory and blessing" (Rev. 5:12). We will come back to the meaning of this scene at the end of this paper. For the moment, it is sufficient to emphasize that the literary association between "nature as creation" and "nature as a book" relies upon the clear association existing between the world and the Word, a relationship that is remarkably theological in character. God creates by his Incarnate Word and the world conveys a divine *logos*, i.e., contains and expresses the words of God.

The Fathers of the Church and the Early Christian Writers until Scotus Eriugena

The number of authors who have spoken of the book of nature is very high. The proposal of a philosophical path to recognize a provident Creator starting from the observation of his works, and the view that through these works he speaks to us, are ideas which belong to the entire history of human culture, from the very beginning up until today. It seems that the attitude of looking at nature as if it were a book first began to be recorded clearly in the early Christian literature. Although we cannot exclude that it was present in previous cultures, for writing techniques were spread throughout the Mediterranean area from 3500 BC, it certainly arises within a religious context. The Fathers of the Church employ it in two main ambits: (1) the so-called cosmological argument, by which they invited others to acknowledge a provident God-Creator starting from the observation of the order and beauty of the creatures, and (2) the cosmic dimension of liturgy, for God had to be celebrated and praised in his glory, also in the context of nature.

The words of Anthony the Abbot (third century) probably give the first example of hermitage: "My book is the created nature, a one always at my disposal whenever I want to read God's words."⁵ As pointed out a bit later by Isaac of Nineveh, nature was given to human beings prior to them receiving the sacred Scriptures.⁶ Among the Fathers of the Church, explicit references to the book of nature can be found in St. Basil, St. Gregory of Nyssa, St. Augustine, John Cassian, St. John Chrysostom, St. Ephrem the Syrian, and Maximus the Confessor. If we also include those authors who implicitly refer to the book of nature, for example, those who said that God "speaks to us through

creation," the list would become much larger and quite uncontrollable.⁷ It is enough, for our purposes, to offer here some quotes and afterward to try to summarize some leading ideas.

The Greek father, St. Basil of Cesarea (329–379), wrote:

We were made in the image and likeness of our Creator, endowed with intellect and reason, so that our nature was complete and we could know God. In this way, continuously contemplating the beauty of creatures, through them as if they were letters and words, we could read God's wisdom and providence over all things.⁸

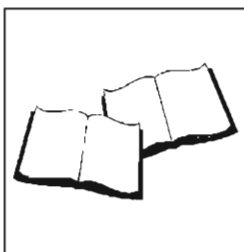
It seems that the attitude of looking at nature as if it were a book first began to be recorded clearly in the early Christian literature.

Among the Latin Fathers, it is St. Augustine (354–430) who, despite his preference for apologetic arguments based on an anthropological, rather than on a cosmological path, dedicates various passages to the book of nature. These often involve interesting comparisons with the book of Scriptures. For example, St. Augustine wrote:

It is the divine page that you must listen to; it is the book of the universe that you must observe. The pages of Scripture can only be read by those who know how to read and write, while everyone, even the illiterate, can read the book of the universe.⁹

Some people in order to discover God, read a book. But there is a great book: the very appearance of created things. Look above and below, note, read. God whom you want to discover, did not make the letters with ink; he put in front of your eyes the very things that he made. Can you ask for a louder voice than that?¹⁰

In a page of his *Confessions*, chap. XIII, the metaphor of heaven as a book is combined with the biblical image of the starry sky stretched over us like a skin. God clothed our naked first parents with a skin just after they sinned, thus showing his mercy for us; likewise the heavens are a skin which also shows God's mercy, because, reading them as in a book, human beings can know the will of God and behave in a virtuous and honest way.¹¹ Referring to creation, Augustine says: "For we know no other books which so destroy pride, which so destroy the enemy, who resists your reconciliation by defending his own sins."¹²



Commenting
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Ambigua,
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(2) the divine
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and Scripture.

Article

The Two Books Prior to the Scientific Revolution

In contrast to human beings, the angels do not need to read the heavens, for they always behold God's face and perfectly know God's will; indeed, God himself is their book.¹³

Over the centuries that followed, especially during the Middle Ages, Maximus the Confessor (580–662) exerted a remarkable influence. Commenting on Christ's transfiguration in his *Ambigua*, Maximus compares nature and Scripture to two clothes with which the Incarnated *Logos* was endowed: (1) the natural law being his humanity; and (2) the divine law revealed by Scripture, his divinity. These two laws were presented to us by means of two different books, nature and Scripture. They veil and reveal the same *Logos*; they have the same dignity, and teach the same things. Maximus is even more explicit: the two books have more or less the same content, and he who wants to know and carry out God's will needs them both.¹⁴ In reading the book of nature, the deep mystery of the *Logos* does not vanish nor is it destroyed. Maximus writes:

The natural law, as if it were a book, holds and sustains the harmony of the whole of the universe. Material bodies are like the book's characters and syllables; they are like the first basic elements nearer to us, but allow only a partial knowledge. Yet such a book has also more general and universal words, more distant from us, whose knowledge is more subtle and difficult to reach. The same divine *Logos* who wrote these words with wisdom, is like embodied in them in an ineffable and inexpressible way. He reveals himself completely through these words; but after their careful reading, we can only reach the knowledge that he is, because he is none of those particular things. It is gathering with reverence all these different manifestations of his, that we are led toward a unique and coherent representation of the truth, and he makes himself known to us as Creator, by analogy from the visible, created world.¹⁵

It is worthwhile to mention the great—and I would add the critical—equilibrium of Maximus the Confessor. On one hand, he affirms the need to know the natural law, and maintains that all that is contained in the

Holy Scriptures is also contained in nature (a statement which some centuries later would bring about some problems, as we will see later). On the other hand, faithful to the Greek tradition, he is aware that the knowledge of God through the book of nature remains veiled, deficient, and certainly inferior to that provided by the Bible.

In the ninth century, John Scotus Eriugena (about 810–877) recalled Maximus' image of the transfigured Christ-*Logos*, recommending that we comprehend the human clothes of Jesus, which indicate the material creatures.¹⁶ At the very beginning of the history of salvation, Scotus Eriugena says, Abraham was invited to recognize God not by looking at the Scriptures that did not exist yet, but by looking up at the starry sky.¹⁷ In the works of this Celtic theologian, the idea that God reveals himself through the two books is also present. Nature and Scripture can be both considered as God's theophanies. He writes:

The eternal light manifests it to the world in two ways, through Scripture and through creatures. In no other way the knowledge of God is renewed in us but in the characters (Lat. *apices*) of Scripture and in the forms (Lat. *species*) of creatures.¹⁸

In addition to the above quotations, if we also take into account how the relationship between faith and reason was formulated by the majority of the authors of this same period, the following general conclusions can be drawn:

1. The Fathers of the Church employ the cosmological argument (to infer the *Logos*-God or the divine from nature), one already known to the Platonic, Aristotelian, and Stoic philosophical traditions, and use it to ascend from created being to the Creator. The metaphor of nature as one of God's books is clearly present. When creatures are not compared to letters or words which make up a book written by God, it is nevertheless certain that God speaks to us through nature. The cue is often taken from passages of the Holy Scripture which offered a sound basis to endorse the practicability of such a path.¹⁹
2. The book of nature is as universal as the book of Scripture, and the content of each is to some extent equivalent. At times it transpires that the book of nature is even more universal and more comprehensible

than the book of Scripture. Creation is before everyone's eyes, as a source for a moral and spiritual appeal.

3. The knowledge of the book of nature seems to be relevant, and for some authors even necessary, to correctly understand the book of Scripture, for the knowledge acquired by observing and studying natural things precedes the knowledge of God's revealed words.²⁰

4. With regard to moral and ethical dimensions, there is a strong analogy between natural law (i.e., those moral commandments that are particular to human nature as such) and the revealed divine law. The first is written by God in the world of created beings and in human conscience; the second is written by the same God in the Scriptures.

Authors of the Middle Ages: The Case of Hugh of St. Victor and St. Bonaventure

The metaphor of the two books also survives during the Middle Ages; with theology continuing to inquire about the relationship existing between them.²¹ References to the book of nature can be found, with different nuances and to different degrees in St. Bernard of Clairvaux (1090–1153), Hugh of St. Victor (1096–1141), St. Bonaventure (1217–1274), St. Thomas Aquinas (1224–1274), Thomas of Chobham (about 1255–1327), Dante Alighieri (1265–1321), Thomas of Kempis (1380–1471) and Raymond of Sebond (about 1385–1436), the subject of the next section.

In the Middle Ages, two authors deserve more room for discussion: Hugh of St. Victor and St. Bonaventure.²² Each emphasizes that the universal comprehension of the book of nature is weakened by the reality of human sin. The book of Scripture exerts a kind of "healing action" over the book of nature: after the original fall, and because of our sins, to recognize God in the spectacle of nature is not an easy task to accomplish. Thus a "third" book comes forth, the *book of the Cross*. Christ himself, his Incarnation and his redemption, is compared with a great book, whose reading is necessary to the proper understanding of the other two books. To this respect, Jesus Christ seems to play quite an interesting, twofold role. He acts like a hinge between the two books. When considered as Incarnated Wisdom, he shows a special relationship with the book of Scripture; when considered as the Incarnated Word, he is mainly associated with creation.

Hugh of St. Victor points out that to read the book of nature properly, one needs to have a spiritual, not merely a natural (that is material) attitude. He says:

For this whole visible world is a book written by the finger of God, that is, created by divine power; and the individual creatures are as figures in it, not derived by human will but instituted by divine authority to show forth the wisdom of the invisible things of God. But just as some illiterate man who

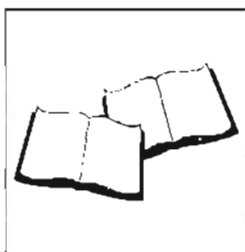
sees an open book looks at the figures but does not recognize the letters: just so the foolish natural man who does not perceive what pertains to the Spirit of God [cf. 1 Cor. 2:14]. He sees the form and the beauty outside creatures without understanding their inner meaning. On the contrary, the spiritual person can judge everything, and when looking at the beauty of the works, he soon realizes how the Creator's wisdom has to be much more admired.²³

*According to [Hugh of St. Victor], ...
nature is compared to a first scripture,
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scripture ...*

According to this medieval Master, God's wisdom is also a unique book, written inside (Holy Scripture) and outside (the works of creation). Nature is compared to a first scripture, the Bible to a second scripture. The Incarnation of the Word is a third scripture, which is seen as a book that also has an inner and an outer side, the first because of his invisible divinity, the second because of his visible humanity.²⁴ All of these images recall that book *written on both sides* which both the prophet Ezekiel and St. John's Book of Revelation speak of.²⁵ In a work titled *De Arca Noe Morali*, Hugh of St. Victor speaks of three books or of three words, but with a different meaning. The first book or word is all of what is made by human activity; the second book or word is creation made by God; and the third book or word is Wisdom himself, that is, the Incarnated Word. In this case, Jesus Christ, as Incarnated Wisdom, plays the role of sacred Scripture, of which he is the fulfilment.²⁶

In the works of St. Bonaventure, the metaphor of the book is widely used, so that expressions such as *liber naturae*, *liber mundi*, and *liber creaturae* are synonyms for nature, world, creation.²⁷ At the same time, the necessity to know God through sacred Scripture and not only through nature, and the demand for a third book, that of Christ Redeemer, is nevertheless explicit. Here are two outstanding texts:

Before sin, man had the knowledge of created things and through their images he was led to know God, to praise, to worship and to love him. The purpose for which living beings exist, is to lead us to God. When human beings fell because of sin, they lost such



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knowledge and so there was no one who could bring all things back to God. Thus this book, that is the world, seemed dead and destroyed. Therefore, there was a need for another book through which the previous book had to be enlightened, in order to acknowledge the true meaning of things. This book is nothing but Sacred Scripture, which contains metaphors, images and teachings about the book of the world. In this way, the book of Scripture restores the whole world, and allows the latter again to lead us to know, to praise and to love God.²⁸

If we want to contemplate spiritual things, we need to take up the cross as if it were a book ... Christ himself is this book of wisdom, who is written inside by the Father, as he comes from the power of God, and outside, when he took on a bodily form. However, this book was open on the cross, and it is this book that we have to read in order to understand the depths of God's wisdom.²⁹

Although these texts allow different interpretations, for instance, whether our intellect was mainly wounded by original sin, or if our knowledge of God is also weakened by our personal sins, the underlying doctrine is clear enough. The book of Scripture and the book of the Cross have a kind of priority with respect to the book of nature, at least with regard to our ability to clearly recognize God. At the same time, St. Bonaventure cannot deny a chronological priority of the book of nature over that of Scripture, as shown by this quote from the *Breviloquium*:

The first Principle is made known to us through Scriptures and creatures. By the book of nature shows itself as the principle of power; by the book of Scripture as the principle of restoring. And since the restoring principle cannot be known without first knowing the principle of power, though the Bible tells us mainly about the work of redemption, it must also tell us about the work of creation.

Despite the fact that we are dealing here with a knowledge of nature *through* the pages of Scriptures, it is clear that such a knowledge calls for a comparison with the natural knowledge acquired by reason.³⁰

Other passages of the Franciscan master recall the image of the book written both inside and outside, an image that works at different levels. All things are like a book written outside, insofar as we confine ourselves to read them as merely effects of God's power. Here is the step where natural philosophers seem to stop. Yet creatures are written inside, when we recognize them as traces or images (Lat. *vestigia*) of God. On a second level, material and irrational things are a book written outside, while rational and spiritual creatures, like humans and angels, are a book written inside, in the depth of their conscience. Finally, Scripture too turns out to be a twofold written book. The outer writings refer to those meanings of Scriptures which are explicit and clear, while inner writings represent those implicit senses and more obscure understandings.³¹

The metaphor of the book is used by other medieval masters, among them Thomas Aquinas. He seems to use it explicitly quite a few times, although it is difficult to pick out a complete set of quotes if our research is confined to expressions such as *liber naturae* or *liber creaturarum*, since the full context is always needed.³² Nevertheless, it is worthwhile recalling that Aquinas provided a synthetic formulation of the relationship between the knowledge of God we acquire by looking at nature, and the one we are taught by reading the Scriptures. With a sentence that will be quoted down through the centuries by many documents of the Church, he affirmed that human natural reason is able to reach a certain knowledge about spiritual realities, such as the existence of God, the immortality of the human soul, the existence of a moral responsibility before a provident Creator, and so on; however, God himself also wanted to reveal these same truths by the pages of the Holy Scripture, so that in this present condition of the human race, they can be readily known by all, with firm certitude and with no admixture of error.³³

To summarize, we can say that the Middle Ages introduced a certain *theological realism* in the question of the two books. Human reason is able to read the book of nature to ascend to God, but we have to take into account the wounds suffered by our intellect because of sin. This great book continues to bind us to our Creator,³⁴ but a

spiritual and clear sight is required to recognize such a link.³⁵ Authors of the Middle Ages do not lose optimism, but seem to gain realism. Actually we could say, by using the words of John Abbot of Ford (d. 1220): "*Est enim liber creaturae et est liber scripturae et est liber gratiae* — there is the book of creatures, the book of Scripture and the book of Grace."³⁶ The book of nature does not lose its universality, but is framed within a strong Christological perspective, and so demands other theological categories, such as Incarnation and redemption, fall and grace. Medieval masters thus extend the metaphor of the book to Christ and to God. God himself, according to the beautiful verses of Dante's *Comedia*, is the book, the volume, whose pages are scattered throughout the world, and which also allows creation to be a book in itself:

In its depth I saw ingathered, bound by love in one single volume, that which is dispersed in leaves throughout the universe: substances and accidents and their relations, as though fused together in such a way that what I tell is but a simple light.³⁷

The First Renaissance: The Case of Raymond of Sebond

A work deserving specific attention is the *Theologia Naturalis seu Liber Creaturarum* (1436) written by Raimundo de Sebunde (Raymond of Sebond, ca. 1385–1436), a Catalan born scholar, Doctor in Medicine and Theology, who was a professor at Toulouse and its president from 1428 to 1435. The title of Sebond's treatise changes a bit depending on the manuscripts existing in different European libraries: *Liber Naturae sive Creaturarum* (Paris), *Scientia Libri creaturarum seu Naturae et de Homine* (Toulouse), *Liber Creaturarum sive de Homine* (Clermond-Ferrand), and so forth. The subtitle *Theologia naturalis* was added by the publishers, starting from its second printing in 1485. This book was remarkably successful. It had sixteen editions and many translations, including a French one by Michel de Montaigne in 1569. Until the beginning of the eighteenth century, various editors also rearranged and reorganized the content of the book for different purposes.³⁸

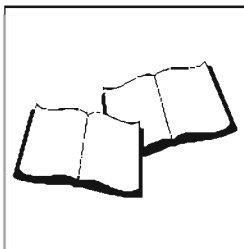
The aim of the work is clear and explicit in the author's *Prologue*: the knowledge of the book of nature allows us to understand, in a true and infallible way, and without much effort, all truths about created things, man, and God. The book of nature tells us all that is necessary for our perfection and moral fulfilment, so that, by reading this book, we can achieve our eternal salvation. Moreover, Sebond adds, it is thanks to the knowledge of the book of nature that we can understand without error what is contained in the book of Scripture.³⁹ In the book of nature, each creature is nothing but a byte and a letter written by the finger of God, such that all these letters and words together form a kind of manuscript, in which the human creature constitutes the most important word.⁴⁰

The relationship between the two books is explained in detail but in a way that deviates, at least on some matters, from the teachings of the medieval masters. Both books were given to us by the same unique God; we received the first one from the creation of the world, while the second one was written thereafter. The book of nature seems to have a certain priority, for it is said that our knowledge of it precedes and confirms the book of Scripture; it is like a door to enter the Bible and a light to illuminate its words.⁴¹ The knowledge of the book of nature is available to everyone, while the book of Scripture can be read only by the clerics. Nevertheless, the book of Scripture was inspired and written to help us read the book of creatures properly, since we were like the blind⁴² — a consideration that certainly refers to human sins and brings Sebond closer to the theologians of the Middle Ages.

Sebond says that we cannot falsify or misinterpret the book of nature, adding that, when studying it, there is no room for heretics or heresies.

With an epistemological optimism that would have amazed many contemporary philosophers of science, Sebond says that we cannot falsify or misinterpret the book of nature, adding that, when studying it, there is no room for heretics or heresies. Contrary to Scripture, nature cannot be deleted nor lost.⁴³ We need both books and they do not contradict each other. They do not differ in their content: all that is present in the first, we also find in the second. They differ with regard to the way in which such content is taught and proved: the book of Creatures teaches by means of a rational demonstration (*per modum probationis*), while the Holy Scriptures are based on God's authority and they teach us by means of prescriptions, commands, and exhortations (*per modum praecepti, mandati, monitionis et exhortationis*).⁴⁴

Sebond strives to keep his balance, but the matter is delicate and somewhat critical. The risk of over-evaluating the book of nature at the expense of the sacred Scripture is real; one could think, for example, that all of what is contained in the Bible can be known simply by looking at the creatures. It is true that he emphasizes in many places that the book of Scripture is "greater and higher" than that of nature, because to speak with the authority of God is superior than demonstrating something by human reason. However, some of the arguments brought about by Sebond are precarious, and at times ambiguous. Trying to



There is no doubt that the content of the *Liber Creaturarum* differs somewhat from the theological perspective held during the Middle Ages. For the first time – and probably beyond the intentions of [Sebond] – we find an attempt to read a moral doctrine in nature in such a way that, in principle, the consideration of the sacred Scriptures could be left out.

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summarize his thought, we could say that from a cognitive point of view, the book of nature is primary and more fundamental; its knowledge is more universal and connatural to us, that is, tailor-made for the human mind.⁴⁵ From the point of view of dignity, the book of Scripture has a higher value, because of the authority on which words contained therein are based.⁴⁶ Yet, the priority of nature serves the Scriptures, because it is directed to the knowledge of the latter. Thus all matter is counter-balanced once again, and Sebond finds his way once more.⁴⁷

It is no surprise that the doctrine of the *Liber Creaturarum* was interpreted and judged in different and sometimes contrasting ways. Some scholars saw in it the danger of reducing the significance of Scripture and weakening the authority of the Church to interpret it. Others saw in the work of Sebond a nice example of natural theology, in tune with the Christian philosophy of the early centuries and the Middle Ages.⁴⁸ It was because of the implicit problems it contained that in 1559 the book was included by Pope Paul IV into the Index of the forbidden books. But a few years later, in 1564, Pope Pius IV limited the prohibition to the *Prologue* only, asking that a note of theological clarification be inserted in all the later publications.

Beyond the course of events and opinions related to the work of Sebond, there is no doubt that the content of the *Liber Creaturarum* differs somewhat from the theological perspective held during the Middle Ages. For the first time – and probably beyond the intentions of its author – we find an attempt to read a moral doctrine in nature in such a way that, in principle, the consideration of the sacred Scriptures *could be left out*. Now the book of nature can be seen as a book autonomous in itself. It is probably from this point, I guess, that the road is open for a “modern religion of nature” capable of conveying moral and spiritual values without a necessary reference to the revealed religion based on the Bible. This will give rise to a couple of philosophical lines of thought.

The first is a kind of “lay sacralization” of nature (we mean here something very different from those other sacred views of nature, utterly Christian in character, highlighted by Scotus Eriugena, the Celtic Christianity, Hildegard of Bingen or Franciscus of Assisi).

A new natural lay religion emerges, having its own rites, prayers, and moral prescriptions, which can easily and dangerously meet the practice of magic and esoteric customs. It will coalesce in the Renaissance, giving rise to a pseudo-philosophy which lasts until our days through some of the manifold expressions of the New Age. The second line of thought is that related to the Deism of the Enlightenment, a religion of reason and nature which leaves aside, and often criticizes, all the *revealed* religions. The latter were considered controversial, that is, as sources of intolerance and division, while a natural religion based on reason was, in the program of the Enlightenment, the only one capable of reuniting in a peaceful way all humankind.

Notwithstanding the fact that the work of Sebond could have nourished these philosophical roots, his ideas deserve to be studied in more depth. His proposal possesses interesting suggestions that might help the development of the contemporary dialogue between religion and science, provided that the relationship between the two books is explained in a slightly more convincing way than that of Sebond.

At the Dawn of Science of the Modern Age: Who Can Read the Book of Nature?

The transition to the Renaissance is, for our topic, particularly critical.⁴⁹ The Patristic Age and the Middle Ages do not know the idea of a dialectic opposition between the two books, as if their mutual comparison were a question to be solved. Authors are not concerned about showing or demonstrating their “harmony,” in the contemporary meaning of the word. Rather, they want to show their common dignity as divine revelation and their role to provide humankind with a true knowledge of the unique God. In light of a human history characterized by the Fall and redemption, their mutual gnoseological relationship (or subordination) is also determined and explained with different emphases, especially within a Christological perspective. The two books are discussed and compared without any need for healing or rectifying any conflict. A number of authors in the fifteenth and sixteenth centuries will continue to maintain that creatures are the

words or the book of God, using this metaphor for rhetoric or spiritual purposes, e.g., Nicholas of Cusa (1401–1464), Martin Luther (1483–1546) or Fray Luis of Granada (1504–1588), but far from any problem of clashing interests.⁵⁰

In contrast, it is the line of thought emphasized by Philippus Paracelsus (1493–1541) which gives rise to a different state of affairs. Following a peculiar interpretation of the work of Sebond, the book of nature now begins to permit a reading which seems to enter into conflict with the Holy Scripture. More than a conflict of contents, it seems to be a conflict of *readers* and *languages*. Against theologians and those scholars who based their studies on the Bible, Paracelsus affirms: “From the light of nature must enlightenment come, that the text *liber naturae* be understood, without which enlightenment no philosopher nor natural scientist may be.” And one of his students will add: “Let the others read their compendiums, while we study in the great picture book which God has opened for us outdoors.”⁵¹

The development of natural studies and experimental observations carried out in the late Renaissance introduced the idea that we can approach the world of the divine without the mediation of sacred Scripture, theology, or scholastic philosophy and, of course, without the mediation of any church. What is at stake is not the existence of God nor the choice of what is the best source (nature or Scripture) to understand who we are and where are we going. In fact, for the Renaissance scientists, it remains clear that God himself wrote the book of nature. The point is that now they can read it directly, praising and worshipping the Architect and the Maker of the world. The accordance between natural philosophy and theology, between nature and Scripture, between natural and revealed moral laws, an accord that was centered for a long time around the mystery of the two human and divine natures of the Incarnated *Logos*, is bound to be broken. A “spiritual” reading of the book of nature is still possible, but it is no longer *Christian*, as will be shown later on by the philosophy of Deism and the spirit of Romanticism. Born in a Christian context, the concept of the world as a book now becomes secularized and alienated from its theological origin.

The discussion of the position held by Galileo Galilei (1564–1642) in such historical process is beyond the aims of this paper.⁵² However, I want to make a couple of comments because he uses the metaphor in a way that contributes to reducing the number of those who are allowed to read the book of the universe. It is true that, in contrast to Paracelsus and to what the deists will later maintain, for Galileo the Author of the two books is undoubtedly the unique God of the Judeo-Christian revelation, for “the Holy Scripture and nature equally proceed from the divine Word, the former as the dictation of the Holy Ghost and the latter as most observant executrix of God’s command,”⁵³ according to the well-known *Letter to Castelli* (1613). Nev-

ertheless, it is clear that “the great book of nature—as he wrote in the foreword of the *Dialogue on the two Chief World Systems* (1632)—is the proper object of natural philosophy,”⁵⁴ and that the reading of the book of nature is a matter for scientists, not for theologians.

The development of natural studies and experimental observations carried out in the late Renaissance introduced the idea that we can approach the world of the divine without the mediation of sacred Scripture, theology, or scholastic philosophy and, of course, without the mediation of any church.

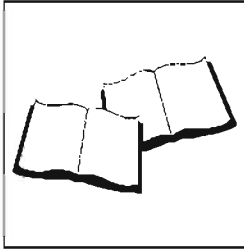
The famous page of the *Assayer* (1923) should be read, in my opinion, precisely in that light:

Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles and others geometric figures without which it is humanly impossible to understand a single word of it; without these, one wanders about in a dark labyrinth.⁵⁵

In 1641, in a letter addressed to Fortunio Liceti, the metaphor is clearly used against the cultural establishment of his time, whose books have now been surpassed, because

the book of philosophy is now that which stands perpetually open before our eyes; but because it is written in characters different from those of our alphabet, it cannot be read by everybody; and the characters of this book are triangles, squares, circles, spheres, cones, pyramids and other mathematical figures fittest for this sort of reading.⁵⁶

It is worthwhile pointing out that since the epoch of the early Fathers of the Church, the meaning of the metaphor is now surprisingly overturned. If St. Augustine could state that “everyone, even the illiterate, can read the book of the universe,” in Galileo’s view, people who are qualified to read it belong to a much narrower circle. Sebond’s



If creation can be said to be a book which reveals something of God, then it must have the capacity to appeal to or to bear meaning to the Incarnate. Human beings must not limit the experience they have of creation to the aesthetic level, but must ask themselves about the Author of beauty.

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proposition that the knowledge of the book of nature is common to everyone, while the book of Scripture can be read only by the clerics, finds its mirror image here, but at the expense of the universality of the book of the world.

The position maintained by Johannes Kepler (1571–1630) seems, in this respect, a bit different. For the German astronomer, too, the book of nature required a rational interpretation, but he was able to clothe his rationality with a mantle of mysticism and spirituality. Astronomers are the high priests of the Most High God and the universe is precisely their book. But its content is more than mere geometry or mathematics, since it can be used like a missal to celebrate, pray, and worship God the Creator. Like Galileo, Kepler holds that nature is a book for scientists, not for theologians, but without giving it a solely “rationalistic” reading, according to the contemporary meaning we now give to this term.⁵⁷ The book of the universe is also suitable for praying to and worshiping, and so it recovers part of its universality.⁵⁸ The astronomer is not forbidden from becoming a theologian.

Thus, having these different and somewhat contradictory nuances, the metaphor of the two books will enter into the Modern Age. With regard to the book of nature, the “rationalistic” and the “spiritual” ways of reading it will survive, but in a new religious context, one that also will oblige scholars to distinguish carefully between different ways to read the Bible.

Reading Nature as a Book: Some Philosophical Perspectives

Returning to the philosophical core of the image of the two books, and particularly to that of nature as a book, does the meaning of such an image entail any consequences for the work of theologians and scientists? The issue is broad, but it is worthy to be explored, at least in a schematic way.

In line with the Fathers of the Church and the authors mentioned above, the teachings of John Paul II (1920–2005) employ the metaphor of nature as a book.⁵⁹ In the encyclical *Fides et ratio* (1998), commenting on a passage of the Book of Wisdom that speaks of

the knowledge of God from his works by analogy, John Paul II states:

This is to recognize as a first stage of divine Revelation the marvelous “book of nature,” which, when read, with the proper tools of human reason, can lead to knowledge of the Creator (n. 19).⁶⁰

Some years later, taking the cue from the commentary to Psalm 18, he will say:

For those who have attentive ears and open eyes, creation is like a first revelation that has its own eloquent language: it is almost another sacred book whose letters are represented by the multitude of created things present in the universe.⁶¹

Thus, it is permissible, from a theological point of view, to present the material universe as part of God’s revelation. Until now, the magisterium of the Catholic church preferred to reserve the term “revelation” only to refer to the historical-supernatural Word of God. For instance, in the documents of the First (1870) and Second (1965) Vatican Councils, when speaking of “creation” or “nature” other attributes were used, such as “testimony,” “witnessing” or “manifestation” of God.⁶² Conversely, the concept of revelation is used in the context of creation by the Catechism of the Catholic Church (1992, 1997) and in other speeches by John Paul II.⁶³

If creation can be said to be a book which reveals something of God, then it must have the capacity to appeal to or to bear meaning to the Incarnate. Human beings must not limit the experience they have of creation to the aesthetic level, but must ask themselves about the Author of beauty.⁶⁴ A book, as a written text, is addressed to someone and contains a message; and it does it more explicitly than the simple view of a landscape. The theological basis to consider creation as the initial stage of divine revelation depends on its direct relationship with the Word-Logos, by which creation took place, and on that Christological dimension which permeates the created world as a whole, a world made through him and for him.⁶⁵

Remarkable consequences also can be seen in the important field of the inter-religious dialogue. If the book of nature is in front of everyone and it manifests the revelation of the true God, then on the basis of this

common acknowledgment a meaningful dialogue can start, provided that the simply aesthetic dimension is complemented with a reliable philosophical framework which is respectful of all the requirements of human rationality. With regard to those who have not received any historical revelation of God, the "word of creation" can play the role of a truly salvific revelation, in the place of Scriptures or other kinds of spiritual mediation. It must be pointed out, however, that nature *alone* does not save anyone. The capability of creation to awaken and convert human hearts to the love of the Creator, closely depends on the link existing between the natural world and the salvific humanity of Christ, the center and the scope of all of creation.⁶⁶

Finally, if theology is invited to open again the "Book of Nature"—a book that some suggested *closing* because it was too difficult to read, or because after Galileo and Darwin it became a source of trouble—it means that the result of natural sciences can be considered a source of positive speculation, so that they truly can help theology to better understand the Word of God.⁶⁷

When seen from the point of view of the activity of scientists, the metaphor of the "book" can be easily connected with the idea of an intelligible and rational universe, fit to be "read" by experiments as well as by theories. The question of the ultimate reason for the intelligibility of the world is indeed present in the contemporary interdisciplinary debate, and many authors have pointed out that such interrogation remains meaningful.⁶⁸ To believe that the natural world has the *logic* of a book, ordered and nonchaotic, written by God and containing a rational message, could influence the "spirit" with which a scientist carries out his or her activity. The following quote by Georges Lemaître seems, in this respect, quite impressive:

Both of them, (the believing scientist and the non-believing scientist) endeavor to decipher the palimpsest of nature, in which the traces of the various stages of the long evolution of the world are overlaid on one another and confused. The believer has perhaps the advantage of knowing that the enigma has a solution, that the underlying writing is, when all is said and done, the work of an intelligent being, therefore that the problem raised by nature has been raised in order to be solved, and that its difficulty is doubtless proportionate to the present or future capacity of mankind. That will not give him, perhaps, new resources in his investigation, but it will contribute to maintaining in him a healthy optimism without which a sustained effort cannot be kept up for long.⁶⁹

There are scientists who speak of their research activity as a sort of "dialogue" between people and nature, and of their discoveries as an experience of "revelation." According to John Polkinghorne:

Physicists laboriously master mathematical techniques because experience has shown that they provide the best, indeed the only, way to understand the physical world. We choose that language because it is the one that is being "spoken" to us by the cosmos.⁷⁰

Nature seems to continue to be seen as a book, despite the passing of the centuries and the change of philosophical paradigms.

Nature is understood as a mystic, appealing partner that appears before the scientist. E. Hubble says:

Sometimes, through a strong, compelling experience of mystical insight, a man knows beyond the shadow of doubt that he has been in touch with a reality that lies behind mere phenomena. He himself is completely convinced, but he cannot communicate the certainty. It is a private revelation.⁷¹

Beyond the words employed to describe such feelings, these experiences are consistent, once again, with the idea that the world can be read, that it conveys a message, that the universe reveals a sort of "cosmic code"—an expression that has become common in popular science. In conclusion, nature seems to continue to be seen as a book, despite the passing of the centuries and the change of philosophical paradigms.

At the beginning of this paper, we mentioned that one of the most solemn visions described in Revelation shows the Lamb who receives from the throne of the Most High a book, the seals of which only he is worthy to open. In this vision, the opening of the scroll is praised not only by peoples of every tongue and nations, but also by all living beings: "Then I heard every creature in heaven and on earth and under the earth and in the sea, everything in the universe, cry out: 'To the one who sits on the throne and to the Lamb be blessing and honor, glory and might, forever and ever.'"⁷² In other words, the Book of all History, of which the Lamb is judge and redeemer, and the book of all natural creation, seem to be summarized and contained in that unique book, the seals of which only the Incarnate Word is worthy of breaking. The Book of History and the book of nature belong to the same book, of which the Incarnated *Logos* is the first and last word, the beginning and end, the *alpha* and the *omega*.⁷³ ♦

Notes

¹This article has been published in the journal of our faculty of theology in Rome, *Annales Theologici* 18 (2004): 51–83 and is reprinted here with permission.

²For the historical perspective, see: D. C. Lindberg, R. L. Numbers, eds., *God and Nature: Historical Essays on the Encounter between Christianity and Science* (Berkeley, CA: University of California Press, 1986); J. Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991); J. J. Clarke, ed., *Nature in Question: An Anthology of Ideas and Arguments* (London: Earthscan, 1993), and A. C. Crombie, *Styles of Scientific Thinking in the European Tradition*, 3 vols. (London: Duckworth, 1994).

³"He commands the sun, and it rises not; he seals up the stars. He alone stretches out the heavens and treads upon the crests of the sea. He made the Bear and Orion, the Pleiades and the constellations of the south" (Job 9:7–9). "I bless the Lord, my soul! Lord, my God, you are great indeed! You are clothed with majesty and glory, covered in light as with a cloak. You spread out the heavens like a tent; you raised your palace upon the waters. You make the clouds your chariot, you travel on the wings of the wind. You make the winds your messengers; flaming fire, your ministers" (Ps. 104:1–4). "It was I who made the earth and created mankind upon it. It was my hands that stretched out the heavens; I gave the order to all their host" (Isa. 45:12). "He who made the earth by his power, established the world by his wisdom, and stretched out the heavens by his skill" (Jer. 10:12, 51:15). Cf. also Isa. 44:24; Isa. 51:13; Zech. 12:1. A different verb, but having an analogous meaning, is that offered by Isa. 48:13: "Yes, my hand laid the foundations of the earth, my right hand spread out (Heb. *piel*) the heavens. When I call them, they stand forth at once."

⁴Cf. G. J. Botterweck, H. Ringgren, H. J. Fabry, *Theological Dictionary of the Old Testament* IX (Grand Rapids, MI: Eerdmans, 1998), 381–7.

⁵Reported by Socrates Scholasticus, *Historia Ecclesiastica* IV, 23, (PG 67, 518).

⁶"Nature was the first book God gave to us, rational beings; ink-written teachings were given after human transgression" (Isaac of Nineveh, *Sermones Ascetici* V).

⁷See, for example, St. Athanasius, *Expositio in Psalmum XVII*, n. 4, (PG 27, 124C); St. John Chrysostomus, *Homilia ad populum antiochenum* IX, 2 (PG 49, 105).

⁸*Homilia de gratiarum actione* 2 (PG 31, 221C–224A).

⁹*Enarrationes in Psalmos* 45, 7 (PL 36, 518).

¹⁰*Sermones* 68, 6 (PLS 2, 505).

¹¹"For heaven shall be folded up like a scroll; and now is it stretched over us like a skin. For your Divine Scripture is of more eminent authority, since those mortals by whom Thou dispenses it unto us, underwent mortality. And you know, Lord, you know, how you with skins did clothe men, when they by sin became mortal. Whence you have like a skin stretched out the firmament of your book, that is, your harmonizing words, by the ministry of mortal men." *Confessiones* XIII, 15, 16.

On the moral value of the book of nature, see also *Reply to Faustus the Manichean*: "But had you begun with looking at the book of nature as the production of the Creator of all, and had you believed that your own finite understanding might be at fault wherever anything seemed to be amiss, instead of venturing to find fault with the works of God, you would not have been led into these unpious follies and blasphemous fancies with which, in your ignorance of what evil really is, you heap all evils upon God." *Contra Faustum* XXXII, 20.

¹²*Confessiones* XIII, 15, 17.

¹³"Let them praise your name, let them praise you, the supercelestial people, your angels, who have no need to gaze up at this firmament, nor to read it to know your Word. For they always behold your face, and there read without any syllables in time, what will your eternal will. . . Their book is never closed, nor their scroll folded up; you are indeed their book, and you are this to them eternally." *Confessiones* XIII, 15, 18.

¹⁴In the sacred Scriptures, the Word is veiled as *Logos*; in the created world, he is veiled as Maker and Creator. Thus I state that both

are needed by he who wants to turn to God judiciously. He needs the spiritual reading of Scripture and the spiritual contemplation of natural creatures. And so the natural law and the written law have the same dignity and teach the same things, in a way that one of them has nothing more, nothing less than the other," *Ambigua* 10 (PG 91, 1128 C).

¹⁵*Ambigua* 10 (PG 91, 1129 A).

¹⁶See on this author, J. Scotus Eriugena, *The Voice of the Eagle. The Heart of Celtic Christianity* (Great Barrington, MA: Lindisfarne Books, 2000).

¹⁷Cfr. *De divisione naturae*, PL 122, 723–4.

¹⁸*Homilia in prologum S. Evangelii secundum Johannem*, chap. XI (SC 151, 254).

¹⁹Cf. Prov. 13:1–9; Rom. 1:18–20; Acts 14:13–18; 17:22–27. It must be emphasized that such a philosophical path does not necessarily rely on a strong metaphysical apparatus, as it will do, for instance, in mediaeval theology. The Fathers of the Church appeal to common sense, to the notion of Providence, to aesthetical and moral arguments. In addition, the *cosmological* path is often associated with the *anthropological* path, that is, they appeal to the capability the pagans had to recognize God in moral imperatives of conscience and in the human search for happiness and love.

²⁰This doctrine is openly affirmed by, among others, St. Basil:

Which is first: knowledge or faith? We say that, on the whole, in the case of sciences, faith precedes knowledge, but in our teaching, even if anyone says that knowledge begins before faith, we do not disagree – but, a knowledge commensurate with human comprehension. In the case of sciences, we must believe first that alpha is so called, and afterwards, having learned the letters and their pronunciation, gain also an accurate notion of the force of the letter. But in our faith concerning God the thought that God exists goes before, and thus we gather from his works. We recognize by observation his wisdom and power and goodness and all his invisible attributes from the creation of the world (*Epistula*, 235, 1 [PG 32, 872B]).

On the same subject, Tertullian says:

We state that first we know God through nature and after we recognize him in the doctrines. Knowledge through nature comes from His works; knowledge through doctrines, from preaching (*Adversus Marcionem* I, 18 [PL 2, 266]).

It is worthwhile noting that the same teaching is recalled, using similar words, by John Paul II's encyclical *Fides et ratio*:

The Acts of the Apostles provides evidence that Christian proclamation was engaged from the very first with the philosophical currents of the time. In Athens, we read, Saint Paul entered into discussion with "certain Epicurean and Stoic philosophers" (17:18); and exegetical analysis of his speech at the Areopagus has revealed frequent allusions to popular beliefs deriving for the most part from Stoicism. This is by no means accidental. If pagans were to understand them, the first Christians could not refer only to "Moses and the prophets" when they spoke. They also had to point to the natural knowledge of God and to the voice of conscience in every human being (cf. Rom. 1:19–21; 2:14–15; Acts 14:6–17) (n. 36).

²¹The consideration of the Islamic tradition is beyond my analysis. However, an overall look at the content of the Koran shows that the term "book" never refers explicitly to nature, but is always used to indicate the same Koran and its laws that are seen as the book *par excellence*. Some Islamic authors have noted that the Koranic verses are called *nyat* ("signs"), as are the phenomena of nature, indicating that the Koran could be seen as the counterpart of a natural text translated into human words. Cf. S. H. Nasr, *Religion and the Order of Nature* (New York: Oxford University Press, 1996). An indirect reference to the difference between Christian and Islamic traditions is made by the *Catechism of the Catholic Church*, n. 108.

²²For the Middle Ages, see J. M. Gellrich, *The Idea of the Book in the Middle Age* (Ithaca, NY: Cornell University Press, 1985).

²³*Eruditiones Didascalicae*, Book VII, chap. 4 (PL 176, 814B).

²⁴"Wisdom was a book written inwardly, while the works of wisdom were a book written outwardly. Thereafter, wisdom was

written once again outwardly in another way, to make it clearer to see and better to understand. In this way, human eyes were enlightened to read this second writing, having become too weak to read the first one. Thus Wisdom made a second work, which not only showed but also enlightened. Wisdom took the human flesh without losing his divinity, making a book written both outwardly and inwardly; it was written outwardly in humanity and inwardly in divinity, so that it could be read outwardly looking at the visible, and inwardly contemplating the invisible; reading outwardly to be healed, reading inwardly to be delighted, acquiring merit by reading outwardly, and joy by reading inwardly. [...] The book, then, was written once inwardly and twice outwardly. The first outward writing was made by the visible creatures, the second one by the flesh he took. The first one to rejoice, the second one to heal; the first one according to what was given by nature, the second one to forgive the sin; the first one to nourish nature, the second one to cure of vice, and so to make nature blessed" (*De sacramentis*, Book I, Pars VI, chap. 5 [PL 176, 266–7]).

²⁵Cf. Ezek. 2:9–10; Rev. 5:1.

²⁶"There are three books. The first is what man makes from something existing; the second is what God created out of nothing, the third is he whom God generated from himself. The first one is a human work, susceptible of corruption; the second one is a work of God, which never ceases to exist, and in which the Creator's invisible wisdom was written by means of visible works; the third one is not God's work, but God's wisdom, through which he made all things, wisdom that God did not make but generated. In his wisdom, from all eternity, God wrote all that he was going to make according to his providence and predestination. And this is the book of life, in which once something is written it cannot be cancelled; those who shall have merited to be listed in it will live forever" (*De Arca Noe Morali*, Book III, chap. XII: *De tribus libris* [PL 176, 643–4]).

"There are three words. The first word is the human word, which once pronounced, fades away; the second is the word of God that is God's work, which once created, changes without ceasing to exist; the third is the generated, uncreated Word of God, which knows neither beginning nor end, nor suffers change, and this is the Word of life" (ibidem, Book III, ch. XIII: *De tribus verbis* [PL 176, 643–4]).

²⁷See, for instance, *Itinerarium mentis in Deum*, I, 14.

²⁸*Collationes in Hexaëmeron*, XIII, 12.

²⁹*Sermones de Tempore, Feria VI in Parasceve*, sermon II, n. II.

³⁰*Breviloquium*, Pars II, chap. 5.

³¹Cf. *Collationes in Hexaëmeron*, XII; cf. also *Breviloquium*, chap. XII.

³²Explicit references can be found in *Super Epistolam ad Romanos*, chap. I, lect. 6 and in two other works, whose authenticity remain dubious: *Expositio in Apocalypsim*, chap. 3 and *Sermo V de Dominica secunda de Adventu*.

³³"It was necessary for the salvation of man that certain truths which exceed human reason should be made known to him by divine revelation. Even as regards those truths about God which human reason could have discovered, it was necessary that man should be taught by a divine revelation; because the truth about God such as reason could discover, would only be known by a few, and that after a long time, and with the admixture of many errors. Whereas man's whole salvation, which is in God, depends upon the knowledge of this truth. Therefore, in order that the salvation of men might be brought about more fitly and more surely, it was necessary that they should be taught divine truths by divine revelation. It was therefore necessary that besides philosophical science built up by reason, there should be a sacred science learned through revelation" (Thomas Aquinas, *Summa Theologiae*, I, q. 1, a. 1). This doctrine is recalled by the First and by the Second Vatican Council (cf. *Dei Filius*, DH 3005 and *Dei Verbum*, 6).

³⁴"According to the Apostle, ever since the creation of the world, his invisible attributes have been able to be understood and perceived in what he has made, as if this sensible world were a public book, in which everyone is able to read God's wisdom" (St. Bernard of Clairvaux, *Sermones, De Diversis*, IX, 1).

"This world is full of many different creatures: as if it were a book containing many different characters and phrases; a book in which we can read whatever we ought to imitate or to avoid" (Thomas of Chobham, *Summa de arte praedicandi*, chap. 7).

³⁵"If thine heart were right, then every creature should be to thee a mirror of life and a book of holy doctrine" (Thomas of Kempis, *Imitatio Christi*, II, 4).

³⁶John Abbot of Ford, *Super extremam partem Cantici canticorum sermones*, Sermon 104, 1.

³⁷*Commedia*, Paradise, XXXIII, 85–90.

"At the end of the poem, the pilgrim's vision of the whole cosmos as a volume whose leaves are scattered through the layers of the material world merely confirms both Dante's notion that creation is a book and his imaginative impulse of conflating and reconstructing into a unity the rich, unfolding variety of creation," G. Mazzotta, *Dante's Vision and the Circle of Knowledge* (Princeton, NJ: Princeton University Press, 1993), 18.

We have enough reasons to infer that the word "volume" here means "book," and not merely "space." Other parallel pages of the *Comedia* present a volume as what is composed of various "quires" or "sheets" (cf. Paradise, II, 76 and XII, 121). For a philological introduction to Dante's *Comedia*, see C. Singleton, *Commedia. Elements of Structure* (Cambridge, MA: Harvard University Press, 1957).

³⁸Cf. M. de Montaigne, *An Apology for Raymond Sebond*, ed. M. A. Screech (London: Penguin Books, 1987). On this author, see also J. de Puig, *Les sources de la pensée philosophique de Raimond Sebond* (Paris: H. Champion, 1994).

³⁹"Thanks to this learning [of the book of nature] all men are taught how to know those truths regarding the human being and God; the knowledge of which is necessary to be saved, to reach one's fulfillment, and to achieve eternal life. And one acquires this knowledge without difficulty and effort, in an infallible and genuine way. Also thanks to this learning one knows, in the same infallible and genuine way, and with a high degree of certainty, all that is contained in Sacred Scripture, and all that the Scriptures tell and prescribe [...]" (Raymond of Sebond, *Theologia naturalis seu Liber creaturarum*, facsimile of 1852 publication at Sulzbach [Stuttgart-Bad Cannstatt: F. Frommann Verlag, 1966], *Prologus*, 27*–28*).

⁴⁰"Every creature is nothing but a word, written by God's finger; like many different words, all these creatures compose one book which is called the book of creatures. This book includes the human being, who is the most important word contained therein" (*Prologus*, 35*–36*).

⁴¹"The book of creatures, then, is like a door, an introduction and even a light to have access to the book of Scripture, where God's words are contained; and so that presupposes this" (*Titulus CCXI*, 311).

⁴²"The book of Scripture was given to the humankind in the second place, when the first book [of creatures] failed, because man was no longer able to read it. However, the book of creatures is open to everyone, while Scripture is not, since only clerics can read it" (*Prologus*, 36*). The reference to the original sin becomes more explicit by the end of the *Prologue*: "No one can see and read God's wisdom in this ever open book, as such. In fact, one needs to be enlightened by God and cleansed by the original sin" (*Prologus*, 38*).

⁴³"The first book, the book of nature, cannot be falsified, nor destroyed or misinterpreted. Heretics cannot pervert it, nor could one become heretical dealing with it. The second book [of Scripture], on the contrary, can be falsified, be misinterpreted and misunderstood" (*Prologus*, 36*–37*).

⁴⁴Cf. *Titulus CCXI*, 314–5.

⁴⁵"Each one serves the other and one does not contradict the other. The first one is natural to us, the second one is supernatural" (*Prologus*, 37*).

⁴⁶Cf. *Titulus CCXV*, 322–4.

⁴⁷"Between the book of Scripture and the book of creatures, then, there is a high consonance and a mutual advantage. The book of creatures serves the book of Scriptures which gives orders, governs

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and prescribes. Actually, they differ in the way they affirm and tell; the first affirms by means of demonstrations, the second by means of precepts and authoritative teachings" (*Titulus* CCXII, 315).

⁴⁸The *Liber Creaturarum* was known and appreciated by Nicholas of Cusa, Hugo Grotius, Blaise Pascal, Peter Canisio, Franciscus of Sales, Georg Wilhelm Hegel, and Giovanni Regoli, among others.

⁴⁹Cf. A. G. Debus, *Man and Nature in the Renaissance* (Cambridge: Cambridge University Press, 1978); E. Garin, *Rinascite e rivoluzioni. Movimenti culturali dal XIV al XVII secolo* (Bari: Laterza, 1975); E. Garin, *La cultura filosofica del Rinascimento italiano* (Milano: Bompiani, 1994).

⁵⁰Concerning Nicholas of Cusa, see for instance *Idiota – De sapientia*, I, 5; *De Beryllo*, 36.

⁵¹Cf. E. R. Curtius, *European literature and the Latin Middle Ages* (Princeton, NJ: Princeton University Press, 1990), 322. Cf. also W. E. Peuckert, *Paracelsus, Die Geheimnisse. Ein Lesenbuch aus seinen Schriften* (Leipzig: Dieterich, 1941), 172–8.

⁵²For the philosophical and historical contexts, see: W. R. Shea, *Galileo's Intellectual Revolution* (London: Macmillan, 1972); K. J. Howell, *God's Two Books: Copernican Cosmology and Biblical Interpretation in Early Modern Science* (Notre Dame, IN: University of Notre Dame Press, 2002); T. H. Levere and W. R. Shea, eds., *Nature, Experiment, and the Sciences: Essays on Galileo and the History of Science in Honour of Stillman Drake* (London: Kluwer Academic, 1990). Cf. also L. Dupré, *Passage to Modernity: An Essay in the Hermeneutics of Nature and Culture* (New Haven, CT: Yale University Press, 1993).

⁵³G. Galilei, *Letter to P. Benedetto Castelli*, 21.12.1613, "Opere," vol. V, ed. A. Favaro (Firenze: Giunti-Barbera, 1968), 282.

⁵⁴*Dialogo sopra i due massimi sistemi del mondo*, Dedicato al Gran Duca, in *ibidem*, vol. VII, p. 27.

⁵⁵*The Assayer*, in *ibidem*, vol. VI, p. 232.

⁵⁶*Letter to Fortunio Liceti*, January 1641, in *ibidem*, vol. XVIII, p. 295.

⁵⁷"Since we astronomers are Priests of the Most High God with respect to the book of nature, it behooves us that we do not aim at the glory of our own spirit, but above everything else at the glory of God" (J. Kepler, *Letter to Herward von Hohenburg*, 26.3.1598, n. 91, in *Gesammelte Werke* XIII, ed. the Kepler-Kommission, Bayerische Akademie der Wissenschaften (München: Beck, 1937ff), 193. "For it is precisely the universe which is that book of nature in which God the Creator has revealed and depicted His essence and what He wills with man, in a wordless script" (*Epitome Astronomiae Copernicanae*, in *Gesammelte Werke* VII, p. 25). "I make an effort to divulge promptly all these things, for the glory of God, who wants to be known through the book of nature. The more they will be raised, the more I will rejoice, with no envy at all. This is what I want, for I consecrated myself to God. I wished to be a theologian. For a long time I was troubled. But look and see now how God shall be praised through my work" (*Letter to M. Maestlin*, 3.10.1595, n. 23, in *Gesammelte Werke* XIII, p. 40). Cf. also *Mysterium Cosmographicum. Praefatio*, in *Gesammelte Werke* I, p. 5. See O. Pedersen, *The Book of Nature* (Notre Dame, IN: University of Notre Dame Press, 1992), 44–5.

⁵⁸Another example of a more "universal" way to read the book of nature, within a scientific context, is that of Sir Thomas Browne, a physician who was contemporary of Galileo and Kepler. In his work *Religio Medici* (1643), he held that the book of nature is easily understandable by everyone: "Thus there are two books from whence I collect my Divinity; besides that written one of God, another of His servant nature, that universal and publick Manuscript, that lies expans'd unto the Eyes of all: those that never saw him in the one, have discover'd him in the other" (part I, chap. 15). Here "Divinity" means "theology" or "theological studies." Cf. E. R. Curtius, *European Literature and the Latin Middle Ages*, op. cit., p. 323. An attempt to read Thomas Browne's doctrine in a contemporary, personal context, is that provided by A. Peacocke, "The Religion of a Scientist: Explorations into Reality," *Zygon* 29 (1994): 639–59.

⁵⁹On the content of this section, cf. G. Tanzella-Nitti, "The Book of Nature and the God of Scientists according to the Encyclical *Fides et*

ratio," *The Human Search for Truth: Philosophy, Science, Faith. The Outlook for the Third Millennium* (Philadelphia: St. Joseph's University Press, 2001), 82–90.

⁶⁰Cf. Prov. 13:1–9.

⁶¹John Paul II, *General Audience*, Rome, January 30, 2002, n. 6.

⁶²Cf. First Vatican Council, *Dei Filius*, n. 2; Second Vatican Council, *Dei Verbum*, nn. 3 and 6.

⁶³Cf. *Catechism of the Catholic Church*: "Thus the revelation of creation is inseparable from the revelation and forging of the covenant of the one God with his People. Creation is revealed as the first step toward this covenant, the first and universal witness to God's all-powerful love" (n. 288). "Even before revealing himself to man in words of truth, God reveals himself to him through the universal language of creation, the work of his Word, of his wisdom: the order and harmony of the cosmos – which both the child and the scientist discover ..." (n. 2500). Cf. also John Paul II, *Address to the World Youth Day*, August 15, 2000.

⁶⁴Cf. Prov. 13:5.

⁶⁵Cf. Col. 1:16.

⁶⁶Cf. Col. 2:9; Eph. 1:10.

⁶⁷Cf. G. Tanzella-Nitti, "Le rôle des sciences naturelles dans le travail du théologien," *Revue des Questions Scientifiques* 170 (1999): 25–39. On the same topic, more extensively, *Scienze naturali, utilizzo in teologia*, in "Dizionario Interdisciplinare di Scienza e Fede. Cultura scientifica, filosofia e teologia," ed. G. Tanzella-Nitti and A. Strumia, 2 vols. (Roma: Urbaniana University Press – Città Nuova Editrice, 2002), vol. II, 1273–89 (English translation *Natural Sciences, in the Work of Theologians*, in the web page "Interdisciplinary Encyclopedia of Religion and Science," www.ctns.org/encyclopaedia.html).

⁶⁸It is common to quote Einstein's question on this subject: "It could be said that the eternal mystery of the world is its comprehensibility ... the fact that it is comprehensible is truly a miracle" ("Physik und Realität," *Journal of Franklin Institute* 221, no. 3 [1936]). On the question of the intelligibility of nature, see, for instance: E. Wigner, "The Unreasonable Effectiveness of Mathematics in the Natural Sciences," *Communications in Pure and Applied Mathematics* 13 (1960): 1–14; M. Heller, "Scientific Rationality and Christian Logos," *Physics, Philosophy and Theology. A Common Quest for Understanding*, ed. R. Russell, W. R. Stoeger, G. V. Coyne (Città del Vaticano: LEV and University of Notre Dame Press, 1988), 141–9; J. D. Barrow, *Pi in the Sky. Counting, Thinking, and Being* (Oxford: Clarendon Press, 1992); P. Davies, *The Mind of God: Science and the Search for Ultimate Meaning* (London: Simon & Schuster, 1992); P. Davies, "The Intelligibility of Nature," *Quantum Cosmology and the Laws of Nature*, ed. R. Russell, N. Murphy, C. Isham (Città del Vaticano: Vatican Observatory Publications and The Center for Theology and Natural Sciences, 1993), 145–61. For a theological perspective, G. Tanzella-Nitti, *Gesù-Cristo, Rivelazione e Incarnazione del Logos*, in "Dizionario Interdisciplinare di Scienza e Fede," op. cit., vol. I, pp. 693–710 (English translation *Jesus Christ, Incarnation and Doctrine of Logos*, web page "Interdisciplinary Encyclopedia of Religion and Science," www.ctns.org/encyclopaedia.html).

⁶⁹O. Godart, M. Heller, "Les relations entre la science et la foi chez Georges Lemaître," *Pontificia Academia Scientiarum, Commentarii*, vol. III, no. 21, p. 11, quoted in John Paul II, *Discourse to the Pontifical Academy of Sciences*, November 10, 1979, in *Osservatore Romano*, English week edition, November 26, 1979, p. 10.

⁷⁰J. Polkinghorne, *One World. The Interaction of Science and Theology* (Princeton, NJ: Princeton University Press, 1987), 46.

⁷¹E. Hubble, *The Nature of Science and Other Lectures* (San Marino, CA: 1954), quoted in O. Pedersen, "Christian belief and the Fascination of Science," *Physics, Philosophy and Theology. A Common Quest for Understanding*, ed. R. Russell, W. R. Stoeger, G. V. Coyne (Città del Vaticano: LEV and University of Notre Dame Press, 1988), 133. On the humanistic and religious experiences associated to scientist's activity, see E. Cantore, *Scientific Man: The Humanistic Significance of Science* (New York: ISH Publications, 1977).

⁷²Rev. 5:13, cf. 5:7–13.

⁷³Cf. Rev. 1:8; 21:6; 22:13.



Book Reviews



ETHICS

THE MORAL LIFE: An Introductory Reader in Ethics and Literature by Louis P. Pojman, ed. New York: Oxford University Press, 2004. 985 pages. Paperback; \$70.95. ISBN: 0195166086.

If you like to contemplate the mysteries, vagaries, puzzles, enigmas, riddles, inequities, controversies, and paradoxes of the moral and ethical life, this book will speed you on your way. It contains a grouping of ninety-two classical and contemporary readings on ethics and morals. The writers cover a wide range of viewpoints, topics, and time periods. They include works by Camus, Dostoevsky, Epictetus, Herodotus, Hugo, Nietzsche, Orwell, Plato, Plutarch, Tolstoy, and many others. Noteworthy are the inclusions of two sermons by Jesus, C. S. Lewis' article entitled "We Have No 'Right to Happiness,'" and Charles Colson's contribution on "The Volunteer at Auschwitz."

Maya Angelou's autobiographical item, "Graduation," is about her graduation from high school in Stamps, Arkansas. Martin Luther King, Jr.'s most famous speech, "I Have A Dream," is included. In the section on "International Justice and the Threat of Terrorism," Joshua 6-8 tells the story of "God's Command to Destroy Jericho and Ai." The story of David and Bathsheba is told under the heading "Lust." Other articles which will appeal to PSCF readers include "The Deep Beauty of the Golden Rule," "The Evil of Lying," and "Licensing Parents."

These articles are intended to lead students to a better understanding of philosophical issues related to relativism, utilitarianism, virtue, the meaning of life, freedom, sex, love, marriage, ecology, and other topics. There are pros and cons on moral relativism, utilitarianism, the Golden Rule, religion and morality, ethical egoism, abortion, and the legalization of drugs.

The book includes helpful chapter introductions, biographical sketches, abstracts, and study questions for each reading selection. Alas, there is no index. There are, however, lists of further readings for each of the sixteen chapters. This book is expensive because it is intended for college students. (Why are college books expensive? One reason is because so many free ones are given as examination copies to potential adopters.)

Pojman is a philosophy professor at the United States Military Academy at West Point. He has written or edited many other books including *Global Environmental Ethics* and *Classics of Philosophy*. Pojman's own writings in this collection include "The Case Against Moral Relativism," "Egoism and Altruism: A Critique of Ayn Rand," and "The Cosmopolitan Response to Terrorism."

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FAITH & SCIENCE

THE CASE FOR A CREATOR: A Journalist Investigates Scientific Evidence That Points Toward God by Lee Strobel. Grand Rapids, MI: Zondervan, 2004. 341 pages, notes, index. Hardcover; \$19.99. ISBN: 0310241448.

Educated at Yale Law School, Strobel was an award-winning legal editor of the *Chicago Tribune* for a number of years. He is the author of several best-selling books, including *The Case for Christ* and *The Case for Faith*. He has been a teaching pastor at two of America's largest churches: Willow Creek Community Church in suburban Chicago and Saddleback Valley Community Church in Orange County, California. During his academic years, Strobel became convinced that God was outmoded and that science had made the idea of a Creator irrelevant. After his wife became a Christian, he began to seriously investigate the claims of Christianity for himself. His journey from atheism to Christian faith is retraced in his book *The Case for Christ*. This book, *The Case for a Creator*, documents how recent developments in science are pointing away from materialism and atheism and instead are pointing toward the existence of God.

The format of this book is identical to Strobel's previous two "Case" books. He interviews a number of different scholars, taking on the role of a skeptic as he searches for answers to questions that plagued him when he was an atheist. Strobel states that he "sought out doctorate-level professors who have unquestioned expertise, are able to communicate in accessible language, and who refuse to limit themselves only to the politically correct world of naturalism or materialism" (p. 28). Those chosen for interviews also represent a variety of scientific disciplines with a chapter devoted to the evidence from each discipline. Those familiar with the Intelligent Design movement will recognize most, if not all of the scholars interviewed.

The first person interviewed is Jonathan Wells of the Discovery Institute and author of *Icons of Evolution*, a book that raises doubts about the evidence for Darwinism. Stephen Meyer, also of the Discovery Institute (an Intelligent Design think tank), is interviewed in chapters four and nine. Michael Behe, author of the book *Darwin's Black Box* and proponent of the concept of irreducible complexity, is interviewed in chapter eight. Others interviewed include J. P. Moreland and William Lane Craig from the Talbot School of Theology, Robin Collins of Messiah College, and the authors of *The Privileged Planet*, Jay Wesley Richards (of the Discovery Institute) and Guillermo Gonzalez.

The evidence that is cited in support of a Creator will be very familiar to readers of this journal. The kalam cosmological argument (whatever begins to exist has a cause, the universe began to exist, therefore the universe has a cause) is supported by recent scientific evidence for the Big Bang theory. In the area of physics, the anthropic principle, which recognizes the incredible fine-tuning of the universe that makes life on earth possible, is discussed in detail. Astronomical evidence comes from a variety of scientific sources; the concept of the Galactic Habitable Zone, the unique arrangement of the planets in our solar

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system, the unusual properties of our sun and moon, as well as from the phenomena on earth that contribute to its ability to sustain life. In the field of biochemistry, the concept of irreducible complexity as it relates to biological structures and biochemical pathways, is used as evidence for Intelligent Design. The failure of origin-of-life theories to adequately explain how chemical evolution could have produced living organisms from nonliving matter is the subject of the chapter on biological information. The last piece of evidence to be addressed focuses on the problem of developing conscious, thinking, feeling, believing creatures from materials that do not have those properties (by a naturalistic evolutionary process).

To whom is this book primarily addressed? After the cumulative case for a Creator is summarized in the last chapter, a challenge is given to spiritual skeptics and seekers to investigate the evidence systematically and enthusiastically, as if their lives depended on it! Strobel clearly desires to reach those who are not Christians, since he includes an appendix that summarizes the historical evidence for Jesus Christ from his book *The Case for Christ*. If his main purpose is to convince unbelievers that God exists on the basis of scientific evidence, one wonders why he chose to only interview individuals who are closely associated with the Intelligent Design movement. His arguments may have been more forceful if at least some of them had been presented by scientists who are not so closely connected to this movement. Several of those he interviewed are actually Christian philosophers rather than practicing scientists, and only two of those interviewed (Behe and Gonzalez) are research scientists in secular universities. Although many quotes from scientists outside of the Intelligent Design movement are included, extended interviews with some of these scientists might have lent more credence to the evidence for a Creator than is presented in this book.

The primary audience appears to be the Christian community as the book is mainly an apologetic for theism and Christian faith. The book can easily be used in a study group setting within the context of the local church. This book could also be used as a text in an introductory course on science and faith at a Christian college. Study questions are provided in the appendix and brief bibliographies are included at the end of each chapter. This book, like Strobel's first two "Case" books, will likely be read by many within the Christian community. Hopefully, many skeptics and seekers will read it as well.

Reviewed by J. David Holland, 868 Oxford Drive, Chatham, IL 62629.

COMING TO PEACE WITH SCIENCE by Darrel R. Falk. Downers Grove, IL: InterVarsity Press, 2004. 234 pages, index. Paperback; \$17.00. ISBN: 0830827420.

ASA member Darrel Falk studied or taught at five secular universities before serving two Christian universities. He is currently professor of biology and associate provost for research at Point Loma Nazarene University.

Falk recalls a picnic with his wife and daughters on a southern California beach over twenty-five years ago. He spotted a Sunday school bus belonging to the denomination in which he grew up. This brought fond memories

of church fellowship that he once enjoyed—a fellowship to which he, as a young adult, felt he could not return. "The chasm that separated us was too great," he writes, and one of the widest gulfs was "my belief in gradual creation."

According to Falk, three origins scenarios are consistent with Scripture: (1) separate origin of each species; (2) separate origin of prototypes, followed by micro-evolution of related species; and (3) each new species arose from a previously-existing species. Many Christians think *creation* can only mean (1) or (2); and that (3) excludes God. To Falk, all three imply Divine involvement. The Bible teaches that life arose at God's command and because of his presence. It does not reveal mechanisms. Falk believes that God gave the creation freedom to act, as he also gave humans moral freedom. Autonomy is implied by phrases such as "Let the waters teem ..." (Gen. 1:20). Falk wants Christians to understand that gradual creation is a valid position for evangelicals to hold.

Evidence from many disciplines suggests that (3) is the most *scientifically* valid position. Astrophysics tells us the universe is 12–13 billion years old. Numerous methods indicate the earth is 4–5 billion years old. Stratigraphy and plate tectonics yield a coherent geological history. Transitional fossils (which Darwin's critics said did not exist) have been found—many during the 1990s.

Genomes change. The changes accumulate at rates that correlate with the geologic events that isolated populations. Cichlid species in Lake Malawi (which formed four million years ago) are more closely related to each other than to cichlids in Lake Tanganyika (which is six million years older). Marsupials in Australia are more similar to each other than to their placental counterparts in South America.

Nonfunctional DNA testifies to a species' past. *SINE CHR-1* occurs at identical loci in all even-toed ungulates, dolphins, and whales. This retroposon (which was inserted by a virus) has been replicated faithfully, and organisms cannot delete it. Its presence strongly implies common ancestry. Like facial scars or lunar craters, it is mute evidence of formative history.

Falk wants fellow believers to understand the reasonableness of his scientific views, but he wants Christian oneness even more.

Unless the church begins to downplay the significance of believing in some variety of sudden creation ... there will continue to be thousands of individuals ... who will be denied true fellowship in God's kingdom ... not because of their refusal to accept Christ ... but because they believe the church doors are not wide open to someone who believes in gradual creation.

It is not hard to find examples of the divisiveness that Falk is talking about. A Google search for "Darrel Falk" directed me to *Christianity4Life*, where Michel Archer brands Falk as a "theistic evolutionist" (TE) and charges that TEs "do not believe the Bible." May God have mercy on us; for his people are fighting a civil war. Falk wants to be a peacemaker.

This is the most helpful book I have ever read on biological origins and Christianity. Every ASA member should own it. Please share this book with your pastor and

with your church's young-adult Sunday school teacher. College biology teachers should assign it as supplemental reading.

As I write these words, I am enjoying a picnic with my daughter at a state park in northeast Ohio. Across the road, a signpost proclaims that we are sitting astride a continental divide. Rain that falls south of us will drain into the Mississippi River and empty into the Gulf of Mexico. Drops that fall north of us will drain into Lake Erie and will eventually reach the Atlantic Ocean via the Saint Lawrence River. *Coming to Peace with Science* is a watershed event in evangelical publishing. Its rhetoric is unusually gracious, and its purpose is to restore fellowship among the body of Christ. Let it be so, Lord.

Reviewed by Joseph H. Lechner, Professor of Chemistry, Mount Vernon Nazarene University, Mount Vernon, OH 43050.

SCIENCE AND THE RENEWAL OF BELIEF by Russell Stannard. Philadelphia: Templeton Foundation Press, 2004. 228 pages, index. Paperback; \$16.95. ISBN: 193203174X.

Stannard is emeritus professor of physics at the Open University in Great Britain. He is highly regarded for his expertise as a physicist and also his ability to popularize issues pertinent to science and faith. He has a number of best-selling books and is a well-known television and radio broadcaster. These unique skills show through in *Science and the Renewal of Belief*, as he makes complex science concepts, such as quantum physics, understandable to the lay reader.

Science and the Renewal of Belief was first published in 1984 in Great Britain. This reprint is an updated version published for the first time in North America. This book contains twenty-two chapters, many of them quite short.

There are several main arguments that undergird Stannard's work. He considers modern science to be continually providing evidence for the legitimacy of basic Christian doctrines, including original sin, the Trinity, and Christ's divine-human nature. This reflects his sincere Christian faith. At the same time, he considers the advances of science to be the first and nearly invincible evidence of truth, and weighs the Bible against the authority of science. For example, he questions the virgin birth and the miracles of Jesus. He said that in some of his miracles Jesus is as much a good psychiatrist as a miracle worker. He explains God's provision of manna as insect secretions on tamarisk leaves. The only supernatural aspect of the Bible that he seems to recognize is the resurrection of Christ. ASA members might be troubled by the casual attitude he takes toward the Bible. His philosophical and scientific prowess provides fascinating fodder for theologians, but most evangelical theologians would find it hard to rest many of his arguments securely in orthodox biblical teaching.

His ideas are creative and fascinating, and his mastery of complex physics concepts is stunning. One of his more interesting concepts is what he calls the "the experiment of prayer." He considers our relationship to God to be of paramount importance, of more importance than our conceptions of God. He wrote that "... all valid statements

they [theologians] make about God are statements about our relationship with God, and any attempt to go beyond that, in order to arrive at an objective description of God in isolation from us, is inadmissible" (p. 214). So he challenges the skeptic to pray for one year and test whether in fact through prayer he meets God. While I suspect that without input from the Word of God, the "prayer" will likely end up an animist or a yogi, he is not so concerned.

Chapter 18 on the role of paradox in science and faith was particularly enriching for me. He has much to offer the Christian struggling to thrive in the relativistic context of postmodern thinking. His ideas will possibly push you deeper into the postmodern waters, but he also provides interesting arguments which will keep you from being washed away.

This book would be good for skeptics who consider science to have eliminated the need for faith. His descriptions of the changing nature of science would challenge their confidence in science and possibly open them up to considering faith. However, unless they had a prior commitment to Christianity, I suspect Stannard's teachings would as likely lead them to new age philosophy as to Christianity. This book could also be used in an upper level course on science and faith. To that end, I found it to be better engaged with the kinds of questions the modern university is throwing our way than most books by more conservative Christians. Many loyal readers of our journal PSCF would enjoy this book, and I do recommend it.

Reviewed by Mark A. Strand, Shanxi Evergreen Service, Yuci, Shanxi, China, 030600.



GENERAL SCIENCES

A SENSE OF THE MYSTERIOUS: Science and the Human Spirit by Alan Lightman. New York: Pantheon Books, 2005. 224 pages. Hardcover; \$17.95. ISBN: 0375423206.

Lightman is the author of several novels that include *Einstein's Dreams*, which was an international best seller; *Good Benito*; *The Diagnosis*, which was a finalist for the National Book Award; and *Reunion*. He also published *Great Ideas in Physics* that serves as a text for a course of the same name at UNC-Wilmington for nonscience majors. His essays have appeared in *The New York Review of Books*, *The New York Times*, *Nature*, *The Atlantic Monthly*, and *The New Yorker*, among other publications. Lightman, who received his Ph.D. in theoretical physics from the California Institute of Technology in 1974, is a novelist, essayist, physicist, and educator. Currently, he is adjunct professor of humanities at the Massachusetts Institute of Technology.

This book represents a collection of essays most of which have appeared previously in various publications. The titles of the essays, which are not in chronological order, are as follows.

In "A Sense of the Mysterious," Lightman recounts his early tinkering with rockets and the realization that beauty at times succumbs to reality not only in the crash of a rocket but also in ideas such as parity conservation in particle physics. Early on, he showed an underlying interest

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in science and art but concentrated on relativistic thermal plasma research at Caltech. This was his introduction to discovering something new in science.

In "Words," Lightman contrasts scientific words that are operationally defined and objects and concepts that the novelist uses but cannot precisely define. It is clear that this distinction is based on the former dealing exclusively with the physical aspect of nature, whereas the latter deals essentially with the nonphysical aspects of human nature.

In "Metaphor in Science," Lightman discusses the use of metaphors in science to create theories, such as the mechanical picture of Maxwell's electromagnetism, and its use to explain results of theories, e.g., the expanding balloon used by Eddington to illustrate the expansion of the universe.

In "Inventions of the Mind," Lightman confronts the intriguing question of why the constructs in pure mathematics find applications in the description of nature. He indicates that the human description of nature relies on the language of mathematics but that the phenomena themselves may not necessitate it. In addition, the success of the use of pure mathematics is because science is a human construct. Alternatively, it may be that our minds are part of nature and thus reflect nature and its logic. Of course, for a theist, the mystery is solved by acknowledging God as the Creator of both humans and nature with humans in turn the creator of mathematics.

In "The Contradictory Genius," "The One and Only," and "Megaton Man," Lightman recounts the lives of Einstein, Feynman, and Teller, respectively. In "Dark Matter," one learns of Vera Rubin, a woman who loved astronomy and discovered mass in spiral galaxies that do not emit light, now christened "dark matter."

In "A Scientist Dying Young," Lightman bemoans how great scientific achievements are accomplished very early in the life of scientists, thirty-six being the average age of physics Nobel laureates. Of course, most scientists dwell happily in teaching, academic administration, and some research. Some continue their love for research on an individual basis while others administer the research done mainly by others.

Finally, in "Prisoner of the Wired World," Lightman decries the modern world of technology with its accompanying benefits and ills. Our society is obsessed with speed and a consequent impatience embedded in consumption and materialism. The world is exploding in communication and computers giving rise to a virtual world devoid of face-to-face personal contacts. People have accommodated themselves to a noisy environment where privacy has been lost by being constantly "plugged-in." Technology has gone from being our servants to becoming our masters!

Lightman gives a personal account of his scientific life. The book is peppered with quotes of famous physicists and insights derived in the pursuit of scientific knowledge and discovery, which is common to all practicing scientists. His writing is very good and informative. However, despite the reference to spirit in the title of the book, no unifying world view is presented that integrates science and the true nature of humans, viz. the spiritual.

The book is entertaining to read and quite informative for its size. ASA members can require it as reading mate-

rial for any course that deals with the anecdotal history of science and a secular critique of modern society.

Reviewed by Moorad Alexanian, University of North Carolina Wilmington, Wilmington, NC 28403.



HEALTH AND MEDICINE

HOLY COW: Does God Care What We Eat? by Hope Egan. Littleton, CO: First Fruits of Zion, 2005. 162 pages. Paperback; \$14.00. ISBN: 189212419X.

Holy Cow is about what you put into your mouth and how it relates to the Bible, health, and longevity. It does not advocate legalism or vegetarianism, but it does come down on the side of those who advocate a diet based on Old Testament dietary laws. It considers the ban on unclean foods just as relevant today as the ban on idolatry and adultery (p. 111). Egan concluded that "the Bible's instructions about which meats God designed to be eaten still applied to us" (p. 8). The concluding chapter is entitled "God's Word Does Not Change—and Neither Does the Physiology of Pork or Shellfish" (p. 83). She believes that "God established His statutes to last forever" (p. 85).

Egan stresses throughout that dietary choices are not related to the hope of salvation. Whatever one's theology, it would be difficult to disagree with the book's conclusion that "eating more vegetables, whole grains, beans, peas, nuts and seeds is a healthy, economical alternative to meat eating ..." (p. 84). Egan offers supporting evidence throughout. One example: "A John Hopkins University study illustrates how pigs and other unclean mammals, birds, fish and insects have significantly higher toxicity levels than clean ones, like cows" (p. 33).

In the chapter "What Would Jesus Eat?" Egan writes: "Dispensational theology holds that there is a 'parentheses' during the Church Age in which believers are not bound by the Hebrew Scriptures' laws, which will become applicable again in the future. This idea of a Torah timeout seems odd" (p. 57). However, to contend that the Old Testament dietary rules should be followed because they are conducive to health may be more reasonable to some Christians than the idea that these Old Testament rules apply to Christians today.

Some readers may question some conclusions. For example, Egan asks: "Did God provide meat in order to shorten our life spans? Would our loving Creator—who carefully created our bodies and a myriad of Gen. 1:29 foods to perfectly fuel them—intentionally provide food that would harm us? I doubt it" (p. 15). But the reader might wonder about tornadoes, hurricanes, floods, and other natural disasters. They certainly cause harm. Where do they come from, if not the Creator?

Egan's co-author, D. Thomas Lancaster, observes that "Whether or not a particular commandment seems to apply in our day is irrelevant" (p. 86). This sweeping generalization seems contradictory to the point of the book. Some of Lancaster's other (controversial and unorthodox?) views include: today unclean animals should not be eaten (p. 96); Peter's sheet vision episode did not relate to which meats are fit to eat (p. 109); Romans 14 and

1 Corinthians 8–10 do not sanction the consumption of unclean meats forbidden by the Torah (p. 117); Acts 15 does not abolish biblical dietary laws (p. 122); and Colossians 2 is not speaking against Old Testament dietary laws (p. 126).

This book is handsomely produced, with easy to read large type, and written in a mostly non-polemic style. The author's irenic attitude may reduce the tendency to argue with some of her conclusions. She writes: "As we explore whether God cares about what we eat, I want to be helpful" (p. 30). She intends the book to be "neither a theological treatise nor a diet manual" (p. 10).

In summary, despite some gentle nitpicking, I liked this book. Christians concerned about obeying God's will in all of life's venues will find this book helpful in dealing with a controversial topic in a thoughtful, helpful, pleasant fashion.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.



HISTORY OF SCIENCE

A SHORT HISTORY OF NEARLY EVERYTHING by Bill Bryson. New York: Broadway Books, 2004. 544 pages. Paperback; \$15.95. ISBN: 076790818X.

Bryson writes books in the genre called "travel literature." And he is an expert at it. *A Walk in the Woods*, about his hiking the Appalachian Trail, is informative, entertaining, and sometimes hilarious. His *In a Sunburned Country* is also deeply amusing and thoughtful as Bryson observed life in Australia as "a place with the friendliest inhabitants, the hottest, driest weather, and the most peculiar and lethal wildlife to be found on the planet."

Now Bryson comes forth with a chronicle of his scientific travels and finds in many parts of the world. His acknowledgments include sites and people in the United States, England, Australia, and other places. For three years, he interviewed experts, visited museums, read copiously and amalgamated all he learned into a highly educational and unusually insightful volume. It will interest experts and possibly thrill neophytes. In the Bryson tradition, it manages to amuse quite often: if you dived two and a half miles in the ocean, the water pressure would be "equivalent to being squashed beneath a stack of fourteen loaded cement trucks" (p. 240). Or take the case of J. B. S. Haldane, the absent-minded Oxford professor. Once his wife found him in bed in his pajamas after sending him upstairs to dress for a dinner party. Haldane said he found himself disrobing and assumed it was bedtime (p. 243). The first bathysphere "held two men, but only if they were prepared to become extremely well acquainted" (p. 275).

This relatively long book has the customary table of contents, endnotes, bibliography, and index. Its six major parts are subdivided into thirty easily digestible chapters (wonderful for reading in one sitting without "reader fatigue"). In them you will learn some amazing things and look at things you already know in brand new ways. Bryson has a gift for telling metaphor, illuminative analogy, and potent observation. For example, he starts

chapter 16, "The Lonely Planet," with this trenchant observation: "It isn't easy being an organism. In the whole universe, as far as we know, there is only one place, an inconspicuous outpost of the Milky Way called Earth, that will sustain you, and even it can be pretty grudging" (p. 239). Bryson quotes Freeman Dyson as saying: "The more I examine the universe ... the more evidence I find that the universe in some sense must have known we were coming" (p. 238). Above 5500 meters, women do not provide enough oxygen to a fetus to bring it to full term (p. 259).

Some of Bryson's salient observations may entice you to read this book. If you were to pull atoms from your body with tweezers, "you would produce a mound of fine atomic dust, none of which had ever been alive but all of which had once been you" (p. 2). "Of the billions of species of things which have lived since time began, 99.99% are extinct" (p. 3). "Protons are so small that a little dab of ink like the dot on this *i* can hold something in the region of 500,000,000,000 of them, rather more than the number of seconds contained in half a million years" (p. 9). The edge of the universe is 90 billion trillion miles away, according to Arno Penzias and Robert Wilson (pp. 11–12). It was not until 1978 that anyone noticed Pluto had a moon (p. 19). (Pluto is so small it would cover only half of the United States). Space is so enormous that "it is possible that alien beings travel billions of miles to amuse themselves by planting crop circles in Wiltshire or frightening the day-lights out of some poor guy in a pickup truck on a lonely road" but it does not seem likely (p. 27). Isaac Newton inserted a long needle into his eye socket and rubbed it around to see what would happen (p. 46; fortunately, nothing did). Scientists can calculate the weight of the earth sitting in their La-Z-Boys (5.9725 billion trillion metric tons, p. 62).

Bryson introduces his thoughts with a quote from Leo Szilard who was thinking of keeping a diary: "I am merely going to record the facts for the information of God."

His friend Hans Bethe inquired, "Don't you think God knows the facts?" Responded Szilard: "He knows the facts, but He doesn't know *this version of the facts*." This book is Bryson's version of the facts, and while it may not inform God, it will certainly inform the curious. Bryson is a wonderful writer, and you will be richly entertained and rewarded by reading this book.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.

LIGHTNING MAN: The Accursed Life of Samuel F. B. Morse by Kenneth Silverman. Cambridge, MA: Da Capo Press, 2003. 503 pages, bibliography, notes, index. Paperback; \$20.00. ISBN: 0306813947.

Samuel Finley Breese Morse, the inventor of a technology that revolutionized civilization, transformed transportation, the military, foreign affairs, and the very course of this world's history, was a miserable failure. Morse described his life as "cursed."

A prolific painter, Morse's art was largely unappreciated and often went unsold. His neglect of his wife and children in the pursuit of his career was indecent. He was a

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lifelong Anglophobe (until England granted him a medal). He assured George Vail, who worked closely with him on the invention, that Vail was his "partner," but took all the glory of the results for himself. A zealous Christian, he railed against public education and church-state separation, opposed immigration from "sub standard races," and attacked Roman Catholics and Irish.

Morse vilified Abraham Lincoln as (p. 410) illiterate, inhuman, wicked, and irreligious. He organized a committee for the overthrow of the Emancipation Proclamation, and argued that male domination of females and Negro slavery were God ordained. He saw Abolitionists as the hideous progeny of religious liberalism, a Christian apostasy. The concept (after the Civil War) of black suffrage and interracial marriage threw him into frenzies. He once ran for Mayor of New York City on such a platform, garnering just 78 votes out of 37,000 cast! His commercially successful telegraph brought him much wealth, many honors, hundreds of lawsuits, and interminable debates in the public press. Acclaiming himself always as a "meek Christian," his favorite photograph, bedecked with medals, and taken at age 72 (p. 390), is best described as ludicrous.

Kenneth Silverman, a Pulitzer Prize recipient and a masterful storyteller, depicts Morse in all his complexity. The book is a microhistory of the exciting times of the first seventy-five years of the nineteenth century. It shows how a world was changed, not only by the telegraph, but by other technologies. More than that, it is the very sad story of a man who truly tried to follow Christ, yet never recognized he had lost his way. Morse died in 1872, still defending his claims both in the courts and in the public press. He was not only a failure, but a man unfulfilled, who had lived much of his life in acrimonious legal battles.

Morse was not a scientist; he had no education or training in the sciences. Yet, at age 41, he did have one great idea, conceived (as it seems) on board the ship *Sully*, in October 1832. June 20, 1840 marked the filing of his patent, "a new and useful Improvement in the mode of communicating information by signals, by the application of Electro Magnetism" (p. 212). Four years of experimentation, legal fights, and seeking funding followed. On May 24, 1844, the historic words, "What hath God Wrought," were flashed from Washington to Baltimore.

Three days later accounts of the Democratic Convention in Baltimore were telegraphed to eager listeners in Washington. A day later political negotiations by telegraph between the two cities were underway. The world would never be the same. The impact of the technology drew a nation—and a world—together.

The story is exciting; I found myself unable to put the book down. I heartily recommend it to my ASA colleagues. There are lessons in humility, examples to be avoided, and perspectives on nineteenth century civilization to be gained. Morse's *hammatia* (Aristotle's "fatal flaw") was that he was always sure he was "right," his biblical interpretations "truth," and in the adoption of this rigid and unyielding stance, he brought misery not only on himself but on others.

The most poignant part of the story comes in the final chapter. In 1944 the country celebrated the 100-year anni-

versary of the first telegraphed message. Western Union sent its last domestic telegram in 1960. Morse's invention lasted just 116 years.

Reviewed by John W. Burgeson, 36633 Road, Mancos, CO 81328.

CATHOLIC PHYSICS: Jesuit Natural Philosophy in Early Modern Germany by Marcus Hellyer. Notre Dame, IN: University of Notre Dame Press, 2005. 352 pages, appendix, endnotes, bibliography, index. Paperback; \$50.00. ISBN: 0268030715.

Hellyer is a senior research officer at Parliament House in Canberra, Australia. He previously taught at Brandeis University, and has edited a book of readings on the Scientific Revolution. He received his Ph.D. in the history of science at the University of California, San Diego.

Part 1 of *Catholic Physics* describes the Society of Jesus' program for shaping university instruction in post-Reformation Europe, a program crafted in the middle sixteenth century to maintain Roman Catholicism in Catholic lands and to reclaim Protestant territories for Roman Catholicism. The Jesuits sought to produce leaders for both church and state capable of maintaining and defending Roman Catholic theology. They believed that a firm grounding in scholastic philosophy, i.e., the peripatetic philosophy of Aristotle as Christianized by Thomas Aquinas, was a prerequisite for learning theology. Natural philosophy, based on Aristotle's *Physics*, constituted the second year of the Jesuits' philosophy triennium. Parts 2 and 3 of the book deal with developments in the seventeenth and eighteenth centuries, ending with the suppression of the Society of Jesus by Pope Clement XIV in 1773.

Scholastic physics was a very different thing from modern physics with respect to what was believed to be true about the natural world, with respect to the nature of questions asked, and with respect to the means by which those questions were answered. *Catholic Physics* tells how Jesuit thinking and teaching evolved during the two hundred years they interacted with the new science begun by Copernicus, describing how they actively confronted, rejected, or absorbed crucial components of the Scientific Revolution.

The most important questions of physics for Roman Catholics in the sixteenth century concerned the Eucharist. How could bread and wine be transubstantiated into the physical body and blood of Christ in the Eucharist while maintaining the *accidents*—the physical taste, appearance, odor, etc.—of bread and wine? And how could Christ's body and blood be present on the altars of thousands of churches at the same time? Scholastic physics had provided satisfactory answers to these questions for centuries, but newly-revived atomism challenged the scholastic view. The Jesuits struggled to maintain the scholastic physics of substance and form and accidents throughout the two centuries during which they monopolized philosophy instruction in the universities of Germany. Nevertheless, by the time the Society was suppressed, most Jesuit instructors had adopted atomism, though still maintaining a Roman Catholic understanding of the Real Presence.

Another source of pressure (pun intended) on peripatetic physics that appeared during the sixteenth century

was the air pump invented by Otto Guericke. Guericke, a Protestant with no commitment to Aristotle, claimed to have demonstrated the existence of a vacuum by evacuating various cylinders and spheres. At first the Jesuits opposed Guericke's interpretation of his experiments, but as certain Jesuits began to practice experimental physics for themselves, they began to abandon Aristotle's views. In hindsight, the significance of the air pump for the Jesuits was not primarily its effect on their views regarding the vacuum; rather, it was in moving them to accept experiment as a source of truth in physics.

Catholic Physics is a well-researched book, citing nearly three hundred primary sources, most in Latin, and over four hundred secondary sources. It gives every indication of being an adaptation of the author's Ph.D. dissertation. Nevertheless, *Catholic Physics* is a book the nonspecialist can read without difficulty. It will not interest everyone in the ASA, but some will find it a worthwhile read. Those interested in the history of science will find it fills gaps in their knowledge (I know of no other work dealing with Jesuit natural philosophy in early modern Germany). Some who teach in Christian colleges will find that the Jesuits faced the same problems they face: integrating their faith with new, sometimes disturbing scientific discoveries, working in an institutional framework that exerts pressure to conform, or even explicitly censoring and forbidding divergent opinions.

Reviewed by Robert Rogland, Science Teacher, Covenant High School, Tacoma, WA 98465



NATURAL SCIENCES

INSIDE THE MIND OF GOD: Images and Words of Inner Space by Michael Reagan, ed. Philadelphia, PA: Templeton Foundation Press, 2005. 160 pages. Paperback; \$19.95. ISBN: 1932031901.

Colorful photographs and inspiring words transport the reader *Inside the Mind of God*. Reagan has assembled an impressive group of pictures and words to conjure up a sense of awe and wonder at creation and creation's God. Bacteria, DNA, lung cancer, sperm, adrenaline, protozoa, lymphocytes—they are all pictured here. To highlight the text, luminaries such as Albert Einstein, George Bernard Shaw, Harold S. Kushner, and Elie Wiesel are quoted. And quotes from celebrities appear which might surprise you: Charles Darwin, John Dewey, Christopher Reeve, Albert Camus, and Rene Descartes. Richard Dawkins observes that "the essence of life is statistical improbability on a colossal scale." Elton Trueblood thinks "faith is not belief without proof, but trust without reservation."

Inside the Mind of God was previously published in a hardback edition; this softcover format now makes the book available to more people. The seventeen-page introduction by Sharon Begley, science editor at the *Wall Street Journal*, sets the proper tone with her view that "it is possible to see the sacred in the science of life" (p. 24). This idea is explored in William Paley's *Natural Theology* which holds that God's existence, attributes, and benevolence can be inferred from the intricacies of nature. Michael Reagan, the editor, is president and founder of Lionheart

Books. He has previously produced for Templeton Press *The Hand of God* and *Reflections on the Nature of God*.

This is a wonderful book to give as a gift. It could also serve as a resource for personal devotions. No matter the reader's view of theology, it will be difficult to ponder the words and pictures in this book without being emotionally and spiritually touched. The reader will be impressed with the magnificence of creation and the Creator.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.



ORIGINS & COSMOLOGY

BY DESIGN OR BY CHANCE? by Denyse O'Leary. Minneapolis, MN: Augsburg, 2004. 337 + xiii pages. Paperback; \$15.99. ISBN: 0806651776.

In this book, Canadian freelance journalist Denyse O'Leary pitches batting practice for the Intelligent Design movement and observes with satisfaction that it hits a lot of balls into the seats. How it does in real games is a different matter.

The book is divided into four parts which focus, respectively, on cosmology, evolution, creationism, and design, followed by an "Afterword" and extensive notes. The author presents a reasonably accurate survey of the history of ideas about creation and scientific views of cosmological and biological origins and development, and sets out some major controversies involved with these issues. I think she tries to treat different views about origins and development fairly, but her own preferences are not hard to discern. What is problematic is her selection of evidence and arguments, her scientific and theological analysis, and at times her tone.

Take the latter point first. In the discussion of evolution, we encounter several cutesy sarcastic comments such as the one heading a box about the coelacanth: "Oh, Dear! Those Inconvenient Details ..." (p. 70). We do not find these with the presentations of creationism or intelligent design. This in itself makes it pretty clear what the author does not like.

O'Leary correctly points out that there is a wide variety of views labeled "creationism." She makes some criticisms here but seems inclined to treat even young-earth creationism gently. For example, she argues (pp. 142-3) that the belief of young earth creationists that terrestrial life is less than 10,000 years old is no "weirder" than ideas of modern physics such as extra dimensions or multiple universes. Both, she says, are "subject to much ridicule." But it is one thing to be ridiculed for proposing extravagant theories that have not yet received support by correctly predicting novel facts and another to be derided for ignoring mountains of evidence.

O'Leary's heart clearly seems to lie with the Intelligent Design (ID) movement. She sketches its development, describes the basic claims made by Behe and Dembski, and discusses some scientific and theological objections to claims for ID. Unfortunately she does not deal with the most pointed scientific objections. Is Behe right that some

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biological systems are irreducibly complex, so that they could not have developed through natural selection? While O'Leary refers to Kenneth Miller's *Finding Darwin's God*, she mentions only briefly (in another place, p. 45) his arguments about putative irreducible complexity, giving the impression that he can only express a hope that science will some day explain such features. Miller's substantive arguments are not dealt with. Similarly, scientific objections to Dembski's claims about "conservation of information" are not addressed. Instead O'Leary prefers to discuss rhetorical objections such as "ID is merely 'Stealth Creationism'" (p. 190).

The treatment of theological issues connected with ID is no better. While O'Leary recognizes the role of the ID movement in the cultural strategy of Philip Johnson's "Wedge," she does not see that if it is to play that role, it cannot be dissociated from religious claims. If ID is to serve the purpose of helping to destroy naturalism, then the Designer must indeed be God (pp. 212-5 notwithstanding). Conversely, a Designer who is some being within the universe (as with directed panspermia) would, of course, be natural. (And the problem of explaining design would only be pushed back a step.) In order for God to "leave his fingerprints all over the evidence" in Johnson's well-known phrase, God must act directly rather than by means of natural processes which science can investigate, so that ID would be a "science stopper" (pp. 193-4 notwithstanding). Conversely, if God brings about design through natural processes, then there are no such "fingerprints."

A failure to engage seriously with the relationship between divine action and natural processes undermines O'Leary's discussion, a failure common to many ID proponents. On the concluding page of the Afterword, she warns "Christian evolutionists" that "you must be content with a God who is *not* there, except as an emotional experience." This shows that she misunderstands not only the ideas of Christian evolutionists but the classical Christian view of providence. That and other misconceptions outweigh any positive value the book may have. For an overview of the issues, Ted Peters and Martinez Hewlett, *Evolution from Creation to New Creation* (Abingdon, 2003) is greatly to be preferred.

Reviewed by George L. Murphy, St. Paul's Episcopal Church, 1361 W. Market Street, Akron, OH 44313.

EVOLUTION FROM CREATION TO NEW CREATION: Conflict, Conversation, and Convergence by Ted Peters and Martinez Hewlett. Nashville, TN: Abingdon Press, 2003. 215 pages. Paperback; \$20.00. ISBN: 0687023742.

It would be easy to skip over yet another book about evolution and creation but do not miss this one. There has been a lot of debate about these issues, but one problem for the church has been that too many clergy and other theologians have been willing to accept superficial reconciliations of evolution with Christianity, and have not provided theological resources to help people understand the issues involved. Another difficulty is that treatments by scientists sometime present naive theology and those by theologians often have less than adequate scientific treatments.

This book goes a long way toward remedying those problems. It should be a very helpful resource for those who want to lead discussions about creation and evolution with groups of people who have no special scientific or theological expertise.

The authors are well qualified to provide such a resource. Ted Peters, a professor of systematic theology at Pacific Lutheran Seminary, has long been engaged in theology-science discussions and has written and edited several books in the area. Martinez Hewlett, a Roman Catholic, is an emeritus professor of molecular and cell biology at the University of Arizona and an adjunct professor at the Dominican School of Philosophy and Theology in Berkeley. They make no secret of their own position, which falls within the broad category of "theistic evolution." But they also provide fair, though critical, discussion of other views.

One of the points they make is that there are not only the differences between traditional proponents and opponents of evolution, but that today there are some new participants in the debates. Evolutionary theory continues to develop, so that sociobiology and evolutionary psychology provide new challenges for religious believers. Those who reject evolution experienced a revival in the 1960s and now argue against evolution, not just on biblical grounds, but as "scientific creationists." The more recent Intelligent Design (ID) movement cannot in itself be classified simply as an opponent of evolution—though some people associated with it may be. ID holds that complex features of living things cannot be explained by evolution alone, but require belief in a Designer. And a number of theistic evolutionists have gone beyond mere acceptance of evolution and argue for it theologically, making use of concepts related to the theology of the cross and the participation by the creator in the sufferings of the world.

Peters and Hewlett begin by examining the popular notion that these differences are part of a "war" between science and religion and find it wanting. The different understandings of origins may instead represent different views of what good science and true religion should be. The authors also point out that the various views line up differently on different issues. For example, scientific creationism and ontological materialism are at opposite ends of their "Divine Action" spectrum, but they are close together at one end of the "Causal Explanation" spectrum (p. 31). Theistic evolution is close to the middle of both spectra.

Chapters Two and Three describe the development of evolutionary thought from Darwin onward, including not only its treatment of biology in the narrow sense but also attempts to apply it to society (social Darwinism, sociobiology) and psychology. Analyses of scientific creationism and ID follow. While the authors do not accept these positions, they are not simply dismissive of them and try to set out the concerns that motivate their proponents of these views as well as scientific and theological criticisms of them.

Chapter 6 provides a survey of theistic evolution positions. While this is very helpful, I have one criticism. A kenotic view of God's work, in which God voluntarily limits divine action, need not require that God is absent from some processes. It means rather that God acts within

the limits of creaturely capacities to bring about whatever happens in the world.

The final chapter sets out the authors' own proposal for theistic evolution. Those familiar with Peters' work will not be surprised that there is emphasis on God's creative action from the future. (See, e.g., his systematic theology *God: The World's Future*, 2d ed. [Minneapolis, MN: Fortress, 2000].) This chapter provides a unified way of dealing with many of the issues in discussions of creation and evolution. The following glossary of scientific and theological terms will be useful for those who want to understand and participate in these discussions.

This review is a revised version of one published in *Trinity Seminary Review* 26, no. 1 (Winter/Spring 2005).

Reviewed by George L. Murphy, St. Paul's Episcopal Church, 1361 W. Market Street, Akron, OH 44313.

GOD AND EVOLUTION: A Faith-based Understanding by David L. Wilcox. Valley Forge, PA: Judson Press, 2004. 165 pages, notes. Paperback; \$14.00. ISBN: 0817014748.

Wilcox, professor of biology at Eastern University in Pennsylvania and Fellow of the ASA, holds a Ph.D. in population genetics from Penn State University. His research interests include theoretical models of fitness, the nature of genomic blueprint hierarchies, selective models for punctuated change, and human origins. His publications include papers on the integration of science and faith.

God and Evolution consists of fourteen chapters covering a range of topics about evolution and religion. Wilcox begins with discussions of biblical teachings about nature, understanding what science is and how it works, and conflicts between science and religion. From there, he addresses topics such as the earth's age, definitions of evolution and creation, and what is meant by "cause and effect." Wilcox then discusses evolutionary ideas about life's origins, Darwin's concepts of evolution, origins of species, missing links, and the Cambrian explosion. The author covers concepts about human origins in chapter 13, and concludes with a chapter on evolution as creation. The book is mostly well written, with few structural errors and misspellings.

In this small book, Wilcox attempts to show that evolutionary theory and faith in God are not mutually exclusive. He begins with a quote, purportedly from a young girl, that she cannot believe in dinosaurs since they are not in the Bible. Of course, since most of earth's biodiversity is not mentioned in the Bible, does this mean that we cannot "believe" in it (think of bacteria, amoebae, nematodes, and tomatoes)? Wilcox initiates his discourse on the unnatural conflict humans have created between evolution and faith with a discussion of what the Bible says about nature. God created the natural world and governs it, even though the specific mechanics of creation are not spelled out in Scripture. Could the minds of Hebrews in Moses' day, or those of early Christians when the gospels were written, have comprehended the scientific knowledge we have today about how creation functions and how life carries on from generation to generation?

Throughout this book, the author does a relatively good job presenting in lay terms what science and the scientific method are, but still promotes (subtly) the idea that science "proves" hypotheses, rather than finding evidence in support of or disproving them. Wilcox addresses the human-made conflict between science and theology, how this conflict may arise from a human misunderstanding of the Bible and scientific data, as well as how everyone brings presuppositions to any discussion of the topic.

While discussing the earth's age, Wilcox does a creditable job of showing that, logically, a young earth is not possible given evidence from geology and fossil coral reefs. He shows that we should believe the evidence, unless we wish to think that God is in the business of writing fiction upon the earth. Wilcox states that we should not avoid these controversial subjects in our teaching, so that misunderstandings will not be taught without challenge. When considering questions of life's origin, Wilcox says that the Bible tells us that God works through nature, and it is thus wrong to pit God *against* nature; it is his handiwork. The author brings in many ideas about how evolution occurred, as seen by his inclusion of topics such as mutation, missing links, punctuated equilibrium, and adaptive radiation. Each of these is discussed briefly, as is necessary in such limited space, but basic information necessary for understanding the concepts is presented.

In the chapter on human origins, Wilcox does not shy away from providing genetic evidence for the relatedness of human beings to other primates. While doing so, Wilcox is careful to state that *interpretations* of both Scripture and scientific evidence should be held lightly, since interpretations may change as we learn more.

It is refreshing to me, as a Christian biologist, to see an open-minded discussion of evolution from a man of faith. While much evidence for evolutionary change is omitted (such as endosymbiosis, and many excellent plant examples), this is a good starting point for anyone wanting to learn more about evolution and avoid the creationist rhetoric often used in such discussions. The bottom line in this debate is this: Christians cannot proclaim that God's glory can be seen in nature while they ignore nature's complexity and the evidence it provides of evolutionary change. This is intellectual dishonesty and does nothing to convince a nonbeliever that our message can be trusted.

Reviewed by Michael A. Vincent, Department of Botany, Miami University, Oxford, OH 45056.



PHILOSOPHY & THEOLOGY

THE SCIENCE OF GOD: An Introduction to Scientific Theology by Alister E. McGrath. Grand Rapids, MI: Eerdmans Publishing Company, 2004. 271 pages. Paperback; \$25.00. ISBN: 0802828159.

The Science of God is a concise overview of McGrath's seminal formulation of scientific theology. The work is a true distillation of key ideas from the more expansive three-volume work, *A Scientific Theology*, which explores how science informs theology. McGrath has written extensively in the area of science and theology and is eminently quali-

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fied, with Ph.D.'s in biochemistry and theology, in developing this new theological endeavor.

Scientific theology seeks to "explore the interface between Christian theology and the natural sciences, on the assumption that this engagement is necessary, proper, legitimate, and productive" (p. ix).

The book clearly and thoroughly argues key concepts without over-simplification and is prefaced by an excellent introduction. It explains McGrath's development as a scientist and theologian which lead to his vision for a scientific theology. As expected, the book is partitioned into three distinct sections that parallel those of the three volume work: nature, reality, and the theory of scientific theology. The style is relatively relaxed, providing a background to some of the general assumptions of the scientific theology while avoiding detailed discussions.

Scientific theology is developed through a linear progression of ideas beginning with the conception of nature. After summarizing the different historical understandings of nature, McGrath specifically focuses on the Christian doctrine of creation, engaging theology by appealing to "the intrinsic resonance between the structures of the world and human reasoning" (p. 60). The "unreasonable effectiveness of mathematics" and the regularity and intelligibility within nature, form a prelude to a detailed discussion of natural theology. McGrath specifically aims to take natural theology in a new direction. His goal is not to prove the existence of God, but to ask: "What should we expect the natural world to be like if it has indeed been created by such a God? The search for order in nature is therefore intended not to demonstrate that God exists, but to reinforce the plausibility of an already existing belief" (p. 81).

Part 2, "Reality," compares and contrasts knowledge in theology with that of the natural sciences. The approach is reminiscent of Polanyi in that "knowledge arises through a sustained and passionate attempt to engage with a reality that is encountered or made known" (p. 94). McGrath builds on the ideas of Alisdair MacIntyre to ask how effectively can scientific theology provide insight into the existence and ideas of rival philosophies? Airplanes fly and medicines work, underpinning most scientists' position as realists, and yet the pursuit of science is replete with competing theories which leads McGrath to adopt a stratified view of reality. The key issue is that "natural sciences investigate the stratified structures of contingent existence at every level open to human enquiry, while a theological science addresses itself to God their creator who is revealed through them" (p. 151).

The last section of the book, "Theory," requires considerable fortitude from the reader as competing theories are introduced, analyzed, and contrasted with the approach taken in scientific theology. The section begins by arguing for the legitimacy of theory within scientific theology and moves to examine how reality and revelation are represented.

Scientific theology has unleashed a new perspective that is reenergizing the interface between science and theology. McGrath's concise *Science of God* introduces the main issues to a larger audience than his comprehensive trilogy, although the book is still an intellectually demand-

ing read. Given the impact that McGrath's project has unleashed, this book provides an accessible place to begin following what is likely to become one of the most influential areas in the science-religion dialogue.

Reviewed by Fraser F. Fleming, Associate Professor of Chemistry, Duquesne University, Pittsburgh, PA 15282

THE CLOSING OF THE WESTERN MIND: The Rise of Faith and the Fall of Reason by Charles Freeman. New York: Vintage Books, 2002. Paperback; \$16.95. 432 pages. ISBN: 1400033802.

Freeman is a scholar with a specific knowledge of the ancient world he is writing about. The theme of this book is that when Christianity became the accepted religion of the Roman Empire, the Greek intellectual traditions, which were the potential basis of scientific thinking, were swept away and replaced by faith in the dogmas of Church.

In twenty chapters, Freeman sets out the sequential evidence on which his postulates are based. The diction is clear and precise with carefully organized supporting documentation. The author introduces his thesis with an excellent study of the influence of Aquinas on the culture of his time, followed by comments on the contribution of leading individuals in the Church. Although initially oratory skills had governed debates in the Greco-Roman culture, many of these talents were demoted and subsequently lost.

Freeman contrasts the teachings of Jesus, who the Apostle John presents as the *logos*, the force of reason, with those of the Apostle Paul. Jesus expressed himself from within his Jewish culture whereas Paul, the author believes, often encouraged his converts to withdraw from their cultural connections because these were based on the worship of idols, explicit sexuality, and Greek philosophy.

As time passed there were other more subtle changes occurring such as in the attitude to women, who had played important roles as disciples in the early churches. The author describes how Gnosticism, embodying concepts of Platonism, became a threat.

Freeman says some Christian beliefs were partly derived from pagan philosophy. The soul, a pagan concept, was implanted, according to the Church, at conception by a sinful act, sexual intercourse. The author assesses the teaching of the leaders of the churches in the post-apostolic era leading up to the time of Emperor Constantine. After this time, Christianity was officially tolerated, and the church hierarchy shared the wealth and social prestige the Roman Empire made available to it. This was seen in a better lifestyle for church leaders and shown in expenditure on church architecture and in the orthodox tradition in the East, iconography and other art works. Asceticism rejected this newly acquired wealth and opulence of the churches. Desert habitats and personal battles with evil and sexuality were the lot of some of these mystics.

The controversy that accompanied decisions at Nicea in 325 CE was partly fueled by the demand from the emperor that there should be doctrinal unity and order throughout the Empire. The bishops could then be used to support the Empire. These leaders now represented an institutional

hierarchical structure. They interpreted doctrine and finalized the canon of the scriptures. The author explains the influence, in their day, of Arius, Nestorius, Pelagius, Augustine of Hippo, and the Donatists.

Early in the fifth century, secular study was condemned. Intellectuals were silenced. The author outlines how Greek philosophy was preserved through translations of its works into Arabic. Freeman says Arabic was the channel and catalyst leading into the Renaissance which followed many centuries later. The works of Aristotle and other philosophers were available to Aquinas in the thirteenth century.

The replacement of the Greek tradition impeded observation of nature and the cultivation of an inquiring mind. The rejection of a scientific approach to medicine meant that Galen's works remained unquestioned for one thousand years. Magic and relics drew pilgrims to the churches. Obedience to the Church replaced reasoned thought.

Freeman has achieved his aim and has shown that the rational attitude of the Greek intellectual tradition was effectively suppressed by the fourth and fifth centuries of the Christian era. Faith in Church practices now achieved prominence over reason. This was to have dire effects on the development of the scientific method in Europe. The author defines this period as the closing of the Western mind.

This is an excellent book with a wealth of information about the origins of Christianity. Freeman's book is highly recommended. The author's helpful comments integrate the complex changes within the Roman Empire with those occurring in the Church. Freeman therefore presents an important challenge expanding every reader's horizon of early church history.

Vintage Books is to be commended for producing a book with an attractive cover, a sound binding, clear readable type-face, a contents page, introduction, an extensive collection of endnotes, an alphabetical list of the authors cited, an index, and a photo of the author.

Reviewed by Ken Mickleson, 105 St Andrews Road, Epsom, Auckland 1003, New Zealand.

NAMING THE ELEPHANT: Worldview as a Concept by James W. Sire. Downers Grove, IL: InterVarsity Press, 2004. 161 pages, index. Paperback; \$ 14.00. ISBN: 083082779X.

Book publishers deserve a vote of thanks for requiring every book to have a subtitle. Sire's book is a case in point. *Naming the Elephant* could leave the impression that zoologists are considering a new name for the popular zoo animal now referred to as "elephant." Theologians also might shake their heads in disbelief if they read the last sentence in the text which states: "God, indeed, is the name of the elephant." This statement, left alone and not read in context, would suggest that Sire is somewhat irreverent, which is not true.

Those of us familiar with Sire's earlier works are not surprised by his unique gift of expressing complicated concepts in simpler language. Many philosophers and theologians whose works I have read would do well to

follow Sire's example. Carl Sagan, popular exponent of biological evolution, is one that comes to mind. In the books by Sagan that I have read, he neglects to say that his worldview is: *nature is the ultimate reality*. The one exception is his book entitled *Cosmos*. The first line reads: "The cosmos is all there is, or ever was, or ever will be." Some exponents of theism are guilty here also.

A statement on the back cover of Sire's book summarizes very well what the book is all about: "Here is an excellent resource for those who want to explore more deeply how and why worldview thinking can aid us in navigating our pluralistic universe."

Sire enunciates his revised definition of *worldview* in these words:

A worldview is a commitment, a fundamental orientation of the heart, that can be expressed as a story or in a set of presuppositions (assumptions which may be true, partially true or entirely false) which we hold (consciously or subconsciously, consistently or inconsistently) about the basic constitution of reality, and that provides foundation on which we live and move and have our being.

ASA member James Sire has achieved what he set out to accomplish: that God is the ultimate reality. I heartily recommend this book to all ASA members and those seeking to examine their worldview.

Reviewed by O. C. Karkalits, Dean of Engineering and Technology, McNeese State University, Lake Charles, LA 70609.



RELIGION AND CHRISTIAN FAITH

CAN A SMART PERSON BELIEVE IN GOD? by Michael Guillen. Nashville, TN: Thomas Nelson Books, 2004. 170 pages. Hardcover; \$17.99. ISBN: 0785260242.

This book is best described as an apologetic, theodicy, or defense of theism. It will appeal to laypersons in its concise, clear, and convincing approach. Guillen analyzes the position of the six percent of Americans who do not believe in the existence of God. He finds their position untenable. He thinks some people with a high IQ (intelligence quotient) have a very low SQ (spiritual quotient), and conversely. He includes a twenty multiple-choice test at the conclusion of the book to measure SQ. Guillen believes it is possible to believe in God's existence with both your soul and your mind.

Guillen says he is not trying to win anyone over to theism or atheism. He intends to provide evidence for faith in God so that believers need never feel embarrassed for their stance. If you are an atheist, Guillen thinks after examining the facts, you have no justification for denigrating theists.

The book is short with just ten chapters and a brief bibliography. One of the chapters bears the title of the book. Guillen gives quite a bit of autobiographical information about his adventures in science and faith. His conclusion is that faith needs science and science needs faith. He quotes approvingly Albert Einstein: "I think that science without religion is lame and, conversely, religion without science is blind" (p. 80).

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This would be a good book to bolster your faith, to give as a gift to someone struggling with faith/science issues, or to provide the fodder for a lively debate in a discussion group.

Michael Guillen is a theoretical physicist, former science correspondent for *ABC News*, former Harvard University teacher, and is currently president of Spectacular Science Productions and consultant on science for Crystal Cathedral Ministries.

Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.



SOCIAL SCIENCE

HUMAN NATURE AND THE FREEDOM OF PUBLIC RELIGIOUS EXPRESSION by S. G. Post. Notre Dame, IN: Notre Dame Press, 2003. 208 pages, index. Hardcover, \$36.00. ISBN: 0268038279.

The title of this book by Post, professor and associate director for Educational Programs, Department of Bioethics at the Case Western Reserve University, is attractive, and sets the stage for Post's perspective. His central thesis is that a religious inclination is demonstrably part of what it means to be human and that suppression of religious expression is detrimental to both personal and corporate well-being.

Post states in his introduction that he intends to show the place of scientific evidence for this innate trait, and thereby to strengthen the argument for unfettered freedom of religious expression, although he admits that an ethical argument alone is sufficient to support that freedom. He approaches this from several perspectives, beginning with citations of empirical studies that find strong evidence for religiosity in crisis situations. He next discusses studies in neuroscience that show certain human features to be consistent with the evolution of religious tendencies. He then applies this evidence to the natural law argument for a human right to religious freedom. In his concluding chapters, he makes strong ethical arguments for celebrating human religious expression.

The primary strength of this book lies in its scientific evidence and the way in which it is placed within the context of the ethical discussion. In the opening chapters, Post presents unambiguous empirical evidence for something that observers of humanity have long known: religious inclination is found among all peoples. He discusses the positive development of a rising awareness in medicine of the importance of spirituality health and recovery of patients—and argues that neglect of religious training in the medical profession is detrimental to health and recovery. The empirical studies Post includes make a strong and invincible case for protecting religious freedom, since the inclination to religion has been shown to be a core component of human nature.

Some of the strongest arguments Post makes are found in the closing chapters, when he places the empirical fact of human religiosity into the context of ethical arguments for religious freedom. He writes: "A genuinely liberal public world is not one that pushes religious expression into

the underground of privatization, as though such free expression were an obstacle to liberal democracy rather than its essential underpinning" (p. 93). Post argues that demands by secular humanists for utter privatization of religion, i.e., for absolute silence on religious matters in the public square, strike at the very heart of democracy, and of basic human rights.

In my view, Post weakens his approach by resting so much of his case on the assertion that religious inclination is a product of evolution. Given his assertion, I do not see how he can defend himself against secularists who argue with Nietzsche that since we have evolved religious behavior, we will soon evolve "beyond religion." Post has soundly demonstrated that religious inclination is innate, and this is critical, and sufficient for his purposes; but he should have left it at that. Evolutionary principles seem to be an unsteady foundation on which to rest something that is presented biblically as a permanent human feature: namely, the abiding need for a relationship with God.

I am concerned that in invoking evolution as that which produces this inclination, Post has left the door open to solid, effective criticism from the secular existentialist position, while claiming to have defeated it. Post argues, correctly in my view, "that views of human nature are invariably informed by some prior view of the nature of the universe" (p. 109). The secular humanist does not share Post's prior view of the universe, as created and governed by God, and thus will not interpret the data as Post does.

Despite the weaknesses, this work represents a valuable contribution to the discussion of religious freedom, and will be appreciated by a wide audience. Using convincing evidence from medical and neurological studies, Post has demonstrated that religious inclination lies at the heart of what it means to be human. He has argued effectively that suppression by governmental or judiciary pressures of the extension to the public square of this foundational part of our humanity is harmful to both individual and community life. May Post's warnings be heard.

Reviewed by Todd K. Pedlar, Assistant Professor of Physics, Luther College, Decorah, IA 52101.

A BRIEF HISTORY OF DEATH by Douglas J. Davies. Malden, MA: Blackwell Publishing, 2005. 184 pages. Paperback; \$17.95. ISBN: 1405101830.

Davies, a professor at Durham University (in this book, his British spelling and punctuation prevail), has written a number of other books including *Death, Ritual and Belief* (2002) and *Reusing Old Graves* (1995). Recognized as an expert in this area of knowledge, Davies writes about dying, grieving, burial, artistic representations of death, death and memory, fear of death, and tragedies associated with death.

The most influential accounts of mortality, writes Davies, are those of Gilgamesh, Adam and Eve, and Jesus Christ (Davies devotes a lot of space in discussing the variety of Christian views on death). These he considers along with "other myths of death's origin" (p. 1). Individuals face death in four ways: (1) personal grief; (2) the death of

others; (3) personal death awareness; and (4) our actual death (p. 15).

Some of Davies' views may be inaccurate; some are surely controversial. According to Davies, among the Jews, the resurrection of the dead as an act of vindication for the righteous developed about 200 BCE (N. T. Wright, on page 109 in his *The Resurrection of the Son of God*, writes of Dan. 12:2-3: "There is little doubt that this refers to concrete, bodily resurrection." Daniel wrote this about 580 BCE.). Davies thinks the Genesis creation account (p. 4) and Christian eschatology are myths (p. 7).

In addition to its eight chapters, the book contains photos of a crematorium, memorial plaques, coffins, grave-stones, and cemeteries. Included also are an index and thorough bibliography (I was surprised to see no mention of Ernest Becker's Pulitzer prize winner, *The Denial of Death*. However, Davies does acknowledge Becker's key point: People fear being buried alive, suffering in hell, departing the security of one's social circle, and extinction. They control these fears by unconsciously keeping busy, thus denying death [p. 131].) A good deal of the contents of *A Brief History of Death* is based on speculation, not unexpected in a history book.

We learn some interesting things in this book. For example, the Chinchorro people of Chile mummified their dead 2,000 years before the Egyptians (p. 24). In Great Britain, there is a growing interest in natural burial, green burial or woodland burial in keeping with ecological-environmental attitudes (p. 79). Over seventy per cent of Britons are cremated with the remains placed on sites personally significant (p. 103). Zygmunt Bauman thinks society hides death lest individuals lose their will to live and impede cultural progress (p. 116). The first architectural constructions of the early church were "funeral buildings" (p. 118). Albert Schweitzer thought it would be dreadful to be caught up in earthly life without end (p. 135).

Davies concludes: "The history of death is a history of a kaleidoscope of sentiment: hope, fear, longing for and gratitude for love, despair at loss of endeavor, concern for our mate and offspring, whispers of a transcendent sense" (p. 173). The Apostle Paul's concludes: "Where, O death, is your victory? Where, O death, is your sting? ... God gives us the victory through our Lord Jesus Christ" (1 Cor. 15:55-57).

Blackwell Publishing has developed a series of books on important topics relating to culture, theology and reli-

Books Received and Available for Review

Contact the book review editor if you would like to review one of these books. Choose alternate selections. Richard Ruble, Book Review Editor, *Perspectives on Science and Christian Faith*, 212 Western Hills Drive, Siloam Springs, AR 72761. richardanne@cox-internet.com

Mary Jo Bane, et al., eds., *Taking Faith Seriously*, Harvard Univ. Press, 382 pages, 2005
 Chris Bosso, *Environment, Inc.: From Grassroots to Beltway*, Univ. of Kansas Press, 224 pages, 2005
 Ted Burge, *Science and Bible: Evidence-Based Christian Belief*, Templeton Press, 200 pages, 2005
 David Chidester, *Authentic Fakes: Religion and American Popular Culture*, Univ. Cal. Press, 300 pages, 2005
 William Cleary, *Prayers to An Evolutionary God*, Skylight Paths, 182 pages, 2004
 Roy Clouser, *The Myth of Religious Neutrality: An Essay on the Hidden Role of Religious Belief in Theories*, Notre Dame Univ. Press, 400 pages, 2005
 Alvin Deuck & Cameron Lee, eds., *Why Psychology Needs Theology: A Radical-Reformation Perspective*, Eerdmans, 200 pages, 2005
 Phil Dowe, *Galileo, Darwin, and Hawking: The Interplay of Science, Reason, and Religion*, Eerdmans, 205 pages, 2005
 Ron Good, *Scientific and Religious Habits of the Mind: Irreconcilable Tensions in the Curriculum*, Peter Lang Publishing, 104 pages, 2005
 Kent Greenawalt, *Does God Belong In Public Schools?* Princeton Univ. Press, 260 pages, 2005
 Charles Larper, Jr., ed., *Spiritual Information: 100 Perspectives on Science and Religion*, 600 pages, 2005
 Gerald Holton, *Victory and Vexation in Science: Einstein, Bohr, Heisenberg and Others*, Harvard Univ. Press, 230 pages, 2005
 William Hutton & Jonathan Eagle, *Earth's Catastrophic Past and Future: A Scientific Analysis of Information Channeled by Edgar Cayce*, Universal Publishers, 572 pages, 2004

Antje Jackelen, *Time and Eternity: The Question of Time in Church, Science, and Theology*, Templeton Foundation Press, 330 pages, 2005
 Daniel Lee & Robert O'Gorman, eds., *Social Work and Divinity*, Haworth Pastoral Press, 165 pages, 2005
 Francesca McCartney, *Body of Health: The New Science of Intuition Medicine for Energy and Balance*, New World Library, 300 pages, 2005
 Alister McGrath, *Creation*, Fortress Press, 90 pages, 2005
 John McGraw, *Brain and Belief: An Exploration of the Human Soul*, Aegis Press, 400 pages, 2004
 Ernan McMullin, ed., *The Church and Galileo*, Notre Dame Univ. Press, 400 pages, 2005
 Brenda McNeil & Rick Richardson, *The Heart of Racial Justice: How Soul Change Leads to Social Change*, IVP, 188 pages, 2004
 Michael Mallary, *Our Improbably Universe: A Physicist Considers How We Got Here*, Thunder's Mouth Press, 227 pages, 2004
 Alanna Mitchell, *Dancing at the Dead Sea: Tracking the World's Environmental Hotspots*, Univ. Chicago Press, 240 pages, 2005
 F. J. Moloney, *A Hard Saying: The Gospel and Culture*, Liturgical Press, 300 pages, 2005
 David Park, *The Grand Contraption: The World as Myth, Number, and Chance*, Princeton University Press, 331 pages, 2005
 Barbara Rossing, *The Rapture Exposed: The Message of Hope in the Book of Revelation*, Basic Books, 222 pages, 2004
 Michael Ruse, *The Evolution-Creation Struggle*, Harvard Univ. Press, 330 pages, 2005

Book Reviews

gion. Moreover, they all start with the words "A Brief History of ..." The authors are scholars in each field, and the books are brief, informative, and appealing to lay readers. Five have already been published with eight more in preparation. One already available, written by Alister E. McGrath, is *A Brief History of Heaven*. Another one forthcoming is Carter Lindberg's *A Brief History of Love*. People short on time and money, but well-supplied with curiosity and a hunger for knowledge, will find these volumes just fit the need. Davies' *A Brief History of Death* fits the bill and delivers a good deal of information in a small package at a reasonable price.

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AUGUSTINE TO FREUD: What Theologians Tell Us about Human Nature (And Why It Matters) by Kenneth Boa. Nashville, TN: Broadman & Holman Publishers, 2004. 288 pages, appendix, bibliography, footnotes. Paperback; \$14.99. ISBN: 0805431462.

This book is an adaptation of Boa's Ph.D. dissertation at Oxford University, completed in 1994. The purpose of the book is to compare and contrast what selected theologians and psychologists have written about the nature of human needs in order to discover the extent to which the two accounts can be synthesized. This involves three convergence/divergence studies of six theologians and eight psychologists (representing two basic models of personality theory) and the theological and psychological accounts of human needs that emerge from the first two studies. The Appendix is a valuable twenty-page survey of human needs in the New Testament.

Part 1 is concerned with theological accounts of human needs. Boa summarizes what Augustine, Aquinas, Edwards, Kierkegaard, Tillich, and Rahner have written about human needs; then he critiques, compares, and contrasts their views.

Part 2 surveys psychological accounts of human needs by examining the work of Freud, Erikson, Jung, Rank, Maslow, Rogers, Adler, and Fromm. The first four theorists present conflict models of human personality; the last four theorists present fulfillment models. Boa critiques, compares, and contrasts these models in the same way he does the views of the theologians.

Part 3 considers the metaphysical and moral assumptions held by the eight psychologists, psychological accounts of theism and theological accounts of nontheism, interest and self-love, and a contrast between immanent and transcendent solutions to human needs. The comparison and contrast of the theological and psychological models regarding human needs also touches on cognate areas like the question of goodness in human nature, the source of morality, the purpose of life, and the quest for meaning in view of the reality of death.

Augustine to Freud could serve as a source book for those who want a quick summary of the views of the fourteen thinkers whose work is summarized in it, but one's head begins to swim in trying to keep in mind the comparisons and contrasts Boa makes. On the other hand, in the

last chapter he wraps up his study by drawing broad conclusions that are easily understood.

Boa concludes, first, that psychological models are based on metaphysical and moral assumptions as well as on scientific grounds, even though many psychologists are reticent to acknowledge the fact. Secondly, Boa believes that "[d]espite the differences in presuppositions, vocabulary and proposed solutions to the satisfaction of (human) needs, there is a correspondence between the theological models and the psychological models" (p. 160). Thirdly, Boa concludes that "[t]he psychologies in this study have become secular alternatives to the Judeo-Christian worldview and often serve as religious surrogates for the psychotherapists who embrace them as well as their patients" (p. 165). Finally, Boa concludes that these secular alternatives inherently fall short of either understanding or being able to deal as effectively as possible with human needs:

This is not to deny the important and sometimes acute perceptions these personality theorists had concerning human traits and behavior. The problem is that when these true insights are embedded in a reductionistic worldview, the solutions the psychologists offer become superficial (p. 180).

Writing as a convinced Christian, Boa is not concerned that these secular alternatives or religious surrogates will ultimately displace the Judeo-Christian world view. Since they deny or ignore spiritual needs and the vertical, Godward dimension of personality, they cannot finally satisfy:

God uses the pulley of unfulfilled longing to draw people away from idolatrous attachment to the created order to the beatific vision that will satisfy every human need (p. 180).

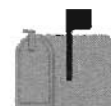
Spiritual autobiographies from Augustine's *Confessions* to C. S. Lewis's *Pilgrim's Regress* have made Boa's final point: humans have a longing for God that the world cannot satisfy. Boa's work is no substitute for classical spiritual biography, but for those who have wondered how to integrate (or whether to hold at arm's length) modern psychology and the Christian faith, it is a rewarding (and quite orthodox) book.

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KINDNESS IN A CRUEL WORLD by Nigel Barber. Amherst, NY: Prometheus Books, 2004. 415 pages; index; endnotes. Hardcover; \$28.00. ISBN: 1591022282.

In a world of aggression and barbarity, whence comes altruism and kindness? Barber skillfully dissects this question in delineating the how, when, who, where, and why of altruistic acts. Along the way, he investigates highway behavior, mutual grooming, religious celibacy, politeness, heroism, reciprocal altruism, and fundamentalism. Barber, former assistant psychology professor at Birmingham-Southern College, is a freelance writer and researcher. He has written *The Science of Romance* and *Why Parents Matter*.

The four major sections are titled "Altruism in Man and Beast," "Growing Up to Be Good," "The Social Impact of Kindness," and "Kindness and Politics." There are twelve chapters nestled within the four sections including "Sterile



Castes of Priests and Nuns," "Altruism Among Thieves," and "Kindness Among Strangers." The book's large type will be appreciated by the visually challenged.

Some of the many intriguing questions addressed by Barber are: why do people donate blood; why did Christians help Jews during the holocaust; why do people adopt; why are worker bees, termites, queen bees, bats, organ donors, priests, and others altruistic. Answers given to these questions by researchers and theorists are among the most interesting parts of the book. For instance, Darwin, baffled by nonreproductive worker bees, imagined altruism resulted from the bee colony making up a superorganism. A better explanation rendered by William Hamilton was based on gene selection (p. 34).

Interesting items abound in this book. Sated bats regurgitate food to sustain their famished friends (p. 10). Almost half of people in England consider their dogs family members (p. 101). (Dogs fit into human societies by treating their owners as top dog.) Pet owners are four times less likely to die in the year after cardiac surgery than patients without pets (p. 190). Children younger than 18 months are not self-aware (p. 103). Chimpanzees show self-awareness, monkeys and gorillas do not (p. 105). Rats are not capable of high moral behavior (p. 111). Children in non-industrialized societies are more altruistic than children in industrialized ones (p. 129).

There is little difference in altruism between men and women (p. 182). For all fifteen of the leading causes of death, men have higher death rates (p. 185). Some Americans have paid no tax for ten years despite being taken to court by the IRS (p. 231). Adoptees have a higher incidence of alcohol and drug use, delinquency, crime, and depression which sometimes leads to attempted suicide (p. 227). Youngsters in poorer countries, compared with those in wealthier ones, are usually more altruistic (p. 14). In-group altruism can translate into out-group aggression (p. 12). The most spectacular failure of altruism relates to violent criminals (p. 13), but mothers who kill their offspring also are examples (p. 14).

Some readers may find Barber's definition of altruism confusing. On page 9, he defines altruism as actions helping another person at some cost to the altruist. ("Some cost" is vague and needs to be operationally defined. Is "some cost" determined by the altruist, the receiver, or society?) On page 10, he adds the qualifier that altruistic acts have no ulterior motive, "except whatever pleasure is derived from the act itself, and no delayed benefit of any kind." (Would not the altruistic acts of Mother Teresa be influenced by her anticipated delayed reward in heaven? Furthermore, how does "reciprocal altruism" qualify as altruism since "a benefit is returned at a future time," p. 43). Then on page 19 an altruist is defined as someone who puts the survival or reproduction of another individual before his own. (Certainly most altruistic acts are performed without the altruist intending to elevate the recipients' survival above his own.)

Religious people may find some of the reported research disconcerting and questionable. For instance, some research shows little scientific support for religion improving health (p. 327). Some scholars think fundamentalist religion undermines moral reasoning (p. 329). A reliable difference between religious people and others is

religious people are more intolerant of ethnic minorities (p. 330). A study found atheists less likely to cheat than religious students (p. 328). There is little evidence that religious people are more ethical or live better lives than non-religious people (p. 329).

Quibbling aside, this is a fun book to read. It will hold your interest throughout. It is full of interesting facts, anecdotes, explanations, observations, and questions. The topic of altruism is certainly an important one in a world so full of meanness, brutality, aggression, and hostility.

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Letters

Why Tie ID to Endosymbiosis?

Michael Buratovich, "The Serial Endosymbiosis Theory: Cellular Origins and Intelligent Design Theory" (PSCF 57, no. 2 [June 2005] 98-113) is impressed by the possibility that ID may explain the transfer of genes from mitochondria to nuclei better than neo-Darwinian evolution. I cannot share his expectations. For a simple analysis, consider a, b, c to be aboriginal mitochondrial genes; A, B, C , the corresponding nuclear genes. Those who must emphasize the diploid nucleus may think of these as AA , etc. The latter are more stable (p. 106). If a is vital to cellular development, then a mutation, am , will almost certainly be deleterious or lethal. If the likelihood of am and its damage is $>n\%$, the corresponding nuclear mutation, Am , with repair options, will be $<n\%$ —grist for the selectivity mill. ID is irrelevant.

As to the order of transfer (pp. 106f), if a is essential to the function of c , C transferred before A will likely be eliminated quickly, whereas C following A will be positively selected. The explanation is strictly neo-Darwinian.

Imagine that b only functions within mitochondria. Then a non-functional B will either be negatively selected or, possibly, be mutated to a different function, as other duplicated genes have been. The original b will have to be maintained if it continues to be relevant.

Someone may argue that this does not explain the deletion of mitochondrial genes. All I can say is that there are numerous examples of apparently simplified genomes in parasitic and symbiotic creatures (an example is given, pp. 104-6). This indicates the presence of a natural mechanism. Again, ID does not seem to have anything to offer. Consequently, I must conclude that the invocation of ID is otiose, perhaps even silly. I regret that so excellent a presentation is vitiated by irrelevant advocacy.

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