# PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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

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*Perspectives on Science and Christian Faith*




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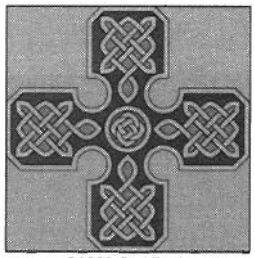



# Christian Environmentalism: Cosmos, Community, and Place

*John Wood, Janel Curry, Steve Bouma-Prediger, Mark Bjelland, and Susan Bratton*

*It is now clear that a sense of place is a human hunger that the urban promise has not met. And a fresh look at the Bible suggests that a sense of place is a primary category of faith.*
*–Walter Brueggemann*[1]

In July of 2003, nineteen Christian scholars gathered at Calvin College for a three-week intensive seminar entitled, "Christian Environmentalism With/Out Boundaries: Living as Part of God's Good Earth." The participants came from academic disciplines that ranged from ecology to history, from geography to communications. Several practitioners were also among the participants. The seminar was organized and led by an interdisciplinary team funded by a Council for Christian Colleges and Universities Networking Grant and Calvin College: John Wood (Biologist, Kings University College); Janel Curry (Geographer, Calvin College); Mark Bjelland (Geographer, Gustavus Adolphus College); Steve Bouma-Prediger (Theologian, Hope College); and Susan Bratton (Ecologist, Baylor University).

The key question addressed by this team and the seminar was: *How can our understanding of self and our moral understanding be deepened to account for our membership in societies that are embedded in particular places, which are, in turn, embedded within ecosystems?* This question reflects the challenge, within academia and the Christian community, of understanding humans as placed simultaneously within societal structures and within nature, in a way that neither negates the uniqueness of humans, created in the image of God, nor denigrates the value of God's creation. The challenge is the full integration of humans, society, and nature into the vision of *shalom* that God intends—an integration that is crucial for our decisions on how to structure our lives in relation to God's good Earth.

Our desire in this special issue of *PSCF* is to present some initial thinking from this ongoing discussion. All of these articles attempt to stretch our understanding of ourselves in relation to each other, to the earth, and to God. We begin by recognizing that we are members of societies that are embedded in particular places, which in turn are embedded within biophysical systems. We are earth creatures and place-makers, constructed from the bones of the earth. We are spatial *creatures* (i.e., *Homo geographicus*) embodied from planetary materials, not just knowing *creatures* (i.e., *Homo sapiens*). How can our moral understanding be deepened to account for these fundamental relationships? Is the full integration of human society and nature desirable, or even possible? Can the vision of God's shalom be achieved, and if so, what might it look like when actualized on earth?

We start with stretching our theological and philosophical understanding of the meaning of humans being created in the image of God. Bret Stephenson,

## In This Issue

We are privileged to publish this cluster of papers on environmental issues and Christian faith. The manuscripts were edited and developed by a working team of five scholars. All have written in the area of environmental science and represent strengths across the theoretical divide as it is presently exists. Steve Bouma-Prediger and Susan Bratton have training in philosophy and theology; Susan also is an ecologist. John Wood is a biologist specializing in aquatic ecology and conservation. Mark Bjelland and Janel Curry are both geographers with social science and physical science training. Mark Bjelland is an environmental engineer. Three peer reviewers, Hank Bestman, Randy Haluza-Delay, and Harry Cook, in addition to the editorial team read and critiqued early drafts of the manuscripts. Harry Cook also did copy editing work on all of the manuscripts.

The guest editorial, written by the editorial team, provides the context for the six major articles that follow. I gratefully acknowledge the contribution of this team and trust our readers will be challenged by their work and effort.

Shalom,
**Roman J. Miller**, *Editor*

The Authors
Top row:
Janel Curry, Steve Bouma-Prediger, and Mark Bjelland
Bottom row:
Susan Bratton and John Wood

**Mark Bjelland** (Ph.D., University of Minnesota) is assistant professor of geography and environmental studies at Gustavus Adolphus College. Dr. Bjelland has degrees in environmental engineering, Christian studies, and a Ph.D. in geography. He studied with Loren Wilkinson at Regent College. He began his career as a consultant, working on a variety of water and environmental remediation projects in the U.S. and Canada. His current research concerns the intersection of environmental degradation, economic distress, and social injustice.

**Steve Bouma-Prediger** (Ph.D., University of Chicago) is associate professor of religion at Hope College in Holland, Michigan. His publications include *The Greening of Theology: The Ecological Models of Rosemary Radford Ruether, Joseph Sittler, and Jürgen Moltmann* (Scholars Press/Oxford University Press, 1995); *Assessing the Ark: A Christian Perspective on Nonhuman Creatures and the Endangered Species Act* (Crossroads, 1997), co-authored with Virgina Vroblesky; *Evocations of Grace: The Writings of Joseph Sittler on Ecology, Theology, and Ethics* (Eerdmans, 2000), co-edited with Peter Bakken; and *For the Beauty of the Earth: A Christian Vision for Creation Care* (Baker Academic, 2001).

**Susan P. Bratton** (Ph.D., ecology, Cornell; Ph.D., arts and humanities, University of Texas) is chair of environmental studies at Baylor University. She is author of two books on Christianity and environmental ethics: *Six Billion and More: Human Population Regulation and Christian Ethics*, and *Christianity Wilderness and Wildlife: The Original Desert Solitaire.* Dr. Bratton has also worked for the U.S. National Park Service as director of a field laboratory. In addition to publishing numerous scientific articles on subjects ranging from fire management in parks to the impacts of wild hogs, she has been writing and teaching in environmental ethics. Her books and articles address such issues as Christian relationship to the land, Christian responses to pollution, and Christian approaches to population issues. She has recently published articles and book chapters on religion and American environmentalism, the ethics of commercial fishing, and Christian ecotheology and the Hebrew Scriptures.

**Janel Curry** (Ph.D., University of Minnesota) is dean for research and scholarship and professor of geography and environmental studies at Calvin College. She has served as chair of the Board of the Leopold Center for Sustainable Agriculture at Iowa State University and as chair of the Rural Geography Specialty Group of the Association of American Geographers. Dr. Curry has publications in geography journals including the *Annals of the Association of American Geographers*, *The Professional Geographer*, and *The Geographic Review* on topics related to human-land relations and how world views affect relations with nature. Her book *Community on Land*, is a history of privatization and degradation of the America "commons."

**John R. Wood** (Ph.D., University of California) is professor of biology and director of environmental studies at The King's University College. He is a Fellow in the American Scientific Affiliation and chair of the Global Resources and Environment Commission. Dr. Wood has published scientific and interdisciplinary papers and he writes a monthly newspaper column. Since immigrating to Canada, his research has been in urban ecology and natural areas conservation. He was a co-editor of the *Mandate for Global Stewardship*, produced by the CCCU Global Stewardship Initiative.

in his article, begins by acknowledging that we humans are interrelated with the nonhuman creatures with whom we share our home planet. He starts with the assumption that human personhood cannot be separated from our relationship with the multiplicity of nonhumans with whom we share this common realm of creation. Yet technology, primarily as it is employed in scientific practice, mediates between humans created in the image of God and the nonhuman creation. Stephenson employs Actor-Network Theorists (ANT) such as Bruno Latour and John Law, as well as Trinitarian theologians such as Colin Gunton and Loren Wilkinson, in an effort to open up an interdisciplinary dialogue among theological anthropology, the doctrine of creation, and sociological accounts of the technological practice of science.[2]

## Perichoresis and Place

Stephenson and several other authors in this volume work from the assumption that all entities (human, nonhuman, technical) are what they are only by virtue of their relationships to other entities. This is similar to traditional Christian claims about God, which have recently been emphasized by so-called social Trinitarians, namely, that God is who God is only by virtue of the relationships among the persons of the godhead. God is, in short, a community of Love—a family of interpenetrating perichoretic Love. A relational ontology is backed by a relational theology. In Christian terms, all being is being-with; all existence is co-existence, because the God who makes and sustains all things is a triune community of mutually engendering and indwelling love.

David Koetje tackles the hot topic of biotechnology, grounded in both this relational view of *imago Dei*, and also in a sense of place as a normative guide for negotiating our right relationship with the earth. To improve food security and environmental sustainability, it is imperative that we follow a paradigm for agricultural research and policy-making rooted in the places we seek to sustain. Place encompasses the ecological and cultural contexts of human enterprises. Appropriate technologies can enhance the resilience of places. However, place is ignored in the prevailing paradigm of industrial agriculture, eroding the cultural and

ecological interrelationships upon which agriculture depends. To reverse this trend, he argues that we need to develop place-based agricultural systems attuned to the ecology of local bioregions, to the needs and knowledge of local communities, and to cultural values, precaution, care, and restraint. This new paradigm emerges from a Christian environmental perspective that engages agricultural biotechnology toward the goal of promoting cultural and ecological resilience. Koetje also puts value on the "community" as the place where these interrelationships are evident in the full flourishing.

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*God's desire for human beings to flourish is subsumed within (but not replaced by) his desire for all of creation to flourish.*

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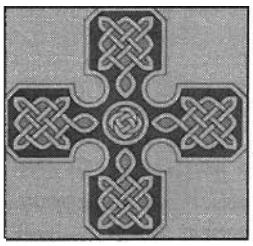
Dave Warners and Larry Borst explore this concept of "flourishing" by taking on one of the dominant and most powerful gods of our age—the god of More Stuff. Historically Christians have had difficulty formulating a widely accepted ethic and praxis regarding material wealth. In the Scripture, material wealth is described in terms of both blessing and caution. The consumptive, affluent lifestyles enjoyed by many North American Christians today find strong affirmation in John Schneider's *The Good of Affluence*.[3] Warners and Borst respond to Schneider's justification of material affluence by pointing out its narrow focus. They claim that Schneider concentrated on the individual and his or her immediate material context, overlooking God's more encompassing desire for all of creation to flourish. Like Stephenson and Koetje, they point to the need for a relational understanding of humans and God's primary desire for human beings to flourish in a diversity of ways. They argue for a position that neither blindly condemns nor uncritically condones material affluence, but rather assesses material affluence based on shalomic living. God's desire for human beings to flourish is subsumed within (but not replaced by) his desire for all of creation to flourish.

Lorynn Divita's article examines the complexity of our daily consumer choices related to, literally, the clothes on our back. Focusing on the apparel industry, she notes that our apparel binds us together inextricably with the earth: by allowing us to exist by shielding us from harsh conditions; and through the impact textile and apparel production methods have on the natural environment. In so doing, she sheds needed light on an industry that has been given relatively little attention. Divita offers an ethical critique from an explicitly Christian perspective. In addition, she points out that our apparel binds us together socially and in powerful metaphorical ways as well. Apparel represents boundaries between us and nature and among humans.

## Boundaries

The scientific enterprise is most often seen as a placeless activity, "the locus classicus of knowledge that is displaced, dislocated, disembedded."[4] But as Livingstone has shown, the boundary between universal scientific knowledge and particular places is more fluid than we have imagined. Issues of boundaries are essential to developing a fully integrated view of humans, the earth, and God. Boundaries are constitutive of life and making a place necessarily involves choices about boundaries. Biologists sometimes speak of "skin-in" or "skin-out" phenomena, cosmologists model the edge of the space-time continuum, chemists partition matter along boundary layers, and engineers search for appropriate boundary conditions for all manner of processes. In the social sciences, geography is the quintessential boundary making and marking discipline. Feminism was built on recognizing the gender boundary as a primary driving force for ordering society. And other, more metaphorical views on boundaries "abound," so to speak. Personal items like clothing and houses serve to delimit space. These personal boundaries provide safety and shelter and offer a horizon or starting place for relationships. Postmodern thought is famous for locating and transgressing social and linguistic boundaries. So it would seem that nearly every aspect of human experience involves boundary making in some fashion. Christian understanding of the environment can be improved by careful thinking about boundaries.

David Clements and Wayne Corapi press us to ask an important question about boundaries: What is a weed? In so doing, they push the ever-present (post)modern issue of boundaries to the fore—the boundary between native and non-native species, between humans and nature, between the individual and a species, and among ecosystems. They present a case study from the Hawaiian Islands, which are extremely vulnerable to weed invasions. They ask: Should it matter to us that this "paradise on earth" is not as it was before these introductions? Do the original Hawaiian ecosystems possess greater intrinsic value than the new exotic plant communities? How do we deal with difficult issues of managing animals (e.g., wild pigs) for the good of an ecosystem? Invasive species are finding themselves in an increasingly borderless world, and as stewards of creation, human beings need to work on setting the boundaries. Restoration of the integrity of ecosystems parallels a broader restoration of society and brings glory to God. How we achieve this restoration in a particular place requires deeper thinking on our relation to all the creatures, and the history of that place.



# Guest Editorial

*Christian Environmentalism: Cosmos, Community, and Place*

*Christian thinking – and environmental thought, in general – needs a deeper understanding of humanity's relationship with nature as it is lived out in society and in communities – the link between philosophy/ theology and the earth.*

Finally, Dorothy Boorse raises questions about the nature of God's plan for all creatures, but especially humans, within the context of this fallen world. She does this by addressing the important issue of anti-aging technology and the human quest for immortality. Current biomedical research shows promise for prolonging human life spans. Responses to these possible technologies vary from extreme caution, to exuberance, to a futuristic vision of humanity transforming itself. Boorse points out that the effect on the environment is unknown, but is likely to be an increase in individual consumption of resources by a few as well as greater gaps between the rich and the poor. She rightly identifies the connection between radical longevity and our view of the self, of humans in community, and our place in the natural world. The biblical norm is not technologically engineered longevity, but a faithful (finite) life of gratitude, joy, and shalom in the context of the relationships within which God has placed us.

## Thinking on the Earth

Christian thinking—and environmental thought, in general—needs a deeper understanding of humanity's relationship with nature as it is lived out in society and in communities—the link between philosophy/ theology and the earth. These articles attempted to start with the assumption of the nonreducibility of morality, social structures, and the earth. This intersection has been increasingly identified as key to addressing environmental and social problems alike. Jeremy Rifkin in his book, *The Biotech Century*,[5] states that the biotechnology issue exemplifies the intersection of morality, societal structure, and nature, yet we have no clear framework for their meaningful integration. Social theorist Robert Sack similarly identifies this intersection of morality, social structures, and nature as a crucial area for work. He claims that traditional moral precepts have focused on our relations to other human beings, but that this is an incomplete conception of our responsibilities. Moral concerns inevitably draw nature into the picture, especially because life is lived within the context of a place and its ecological circumstances. Sack's attempt at building an integrated framework puts the self at the center of concentric circles representing meaning, nature, and social relations.[6] Frameworks, apart from those that put humanity at the center, remain difficult to conceive, even though a sense of morality is recognized as being central to full integration.

Areas in which there needs to be more theorizing, and on which the interdisciplinary group continues to build are as follows:

- *Develop an integrative model of the relationships among God, humans and societal structure, and the earth* that is more complete and nuanced than we presently have. Such a model must move (a) beyond traditional concepts of human stewardship *of* creation to embeddedness *in* social structure and the earth and (b) beyond the human-nature split, evident in the dualisms of nature/culture and nature/ history. Humans and their cultural creations are part of nature, and nature is historical.
- *Build on the assumption of the relational nature of human beings.* Many biblical scholars and Christian theologians now understand the "image of God" in relational terms,[7] but we have yet to understand fully how this profoundly relational nature finds expression in not just human relations, but also in the relationship between humans and land.[8]
- *Assume a covenantal perspective.* This perspective is an alternative starting point to the dominant Lockean contract perspective. The covenant is a relation between God and a people, but the parties to the covenant, unlike the parties in the Lockean contract, have a prior relation: the relation between creator and created. The covenant is also not a limited relation based on self-interest, but an unlimited commitment based on relationships of loyalty and trust. A covenantal perspective, with its emphasis on community and social obligations, provides a necessary corrective to the dominant individualism of a Lockean world view.
- *Recognize the interrelationship of all aspects of reality, drawing especially on the insights of modern ecology, in contrast to various forms of reductionism.* This will include the exploration of community conservation/ political ecology and its models of culture and nature.[9]

- *Build an alternative model of science in relation to human-nature relations.* Problem solving in this area has traditionally been based on a model of rationality that assumes that more information on a phenomenon automatically leads to answers on what actions to take in the management of the creation. Facts have been treated as speaking for themselves, free of the formative influence of the human community. Thus scientific speech has failed to include sufficient legitimacy to communities and social structure. The universalizing nature of science has abstracted nature, humans, and their interrelationships from our more thickly nuanced, intricately interactive reality.
- *Address the problem of assigning value to nature.* Science understands itself to refrain from addressing value questions; yet it engages value issues by focusing on the measurable aspects of the values people assign to nature. Intrinsic value has no place within this framework. Likewise, economics informs the populace of financial costs of choices, but avoids the question of what is possible and what should be desired.

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*A revolution is occurring in Christian thinking on the earth. It is putting an emphasis on particular places, both near and far, and on humans as place-makers.*

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Many questions remain unanswered. We are only at the beginning. But a revolution is occurring in Christian thinking on the earth. It is putting an emphasis on particular places, both near and far, and on humans as place-makers. What sets this thinking apart from mere geographic speculation is the theological perspective that underlies it.[10] We have a desire to find a place, a home, a center of being and community. We humans are place makers, place-building creatures. And the act of making place is inherently moral. Only recently have we begun rediscovering the pervasiveness of place and its moral dimensions. Place has the potential to become a new window onto our relationships to each other, and to things that make up the natural world.

This greater understanding of place-making arises out of the growing Trinitarian dialogue that promises to reshape the way we see our relations to God, to the earth, and to each other. But it also reveals a deep human desire to be connected to each other and to the earth. In the biblically-informed language of the Christian tradition, how are we creatures made in God's image rightly to fulfil our calling to be *Homo faber* in ways that make for shalom? How does this open and inviting communion, the open circle of the Trinity, extend to the rest of creation?

While the authors provide some hints of an alternative vision, much more needs to be said about what specific social arrangements and policies are most faithful to a Christian vision of shalom and conducive of healthy communities and liveable, neighborly places. *What can and what should we do*—in our homes, churches, cities, colleges and universities—to foster the kind of community that makes for a flourishing creation? How do we live, as Aldo Leopold put it years ago, as plain members and citizens of our biotic communities, rather than as conquerors? Or in more explicit Christian terms, how do we faithfully bear witness *now* to God's good future of shalom—of a heaven and earth renewed and redeemed and transfigured? ✦

## Acknowledgment

Our work on this project has been made possible through the Council for Christian Colleges and Universities program of Initiative Grants to Network Christian Scholars. We are also grateful to the Calvin College Seminars in Christian Scholarship program for support for the summer seminar, *Christian Environmentalism With/Out Boundaries: Living as Part of God's Good Earth.*

## Notes

[1]Walter Brueggemann, *The Land: Place as Gift, Promise, and Challenge in Biblical Faith*, 2d ed. (Minneapolis, MN: Fortress Press, 2002).

[2]Colin E. Gunton, *The One, the Three and the Many: God, Creation and the Culture of Modernity* (Cambridge: Cambridge University Press, 1993); and Loren Wilkinson, "The New Story of Creation: A Trinitarian Perspective," *Crux* XXX, 4 (December 1994): 26–36.

[3]John R. Schneider, *The Good of Affluence: Seeking God in a Culture of Wealth* (Grand Rapids, MI: Eerdmans, 2002).

[4]David N. Livingstone, *Putting Science in Its Place: Geographies of Scientific Knowledge* (Chicago: University of Chicago Press, 2003).

[5]Jeremy Rifkin, *The Biotech Century* (New York: Penguin Putnam, 1998).

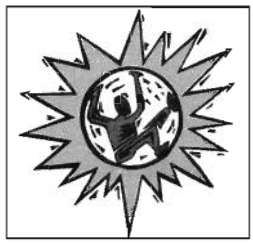
[6]Robert David Sack, *Homo Geographicus: A Framework for Action, Awareness, and Moral Concern* (Baltimore, MD: The Johns Hopkins University Press, 1997), 22–9.

[7]For example, Douglas J. Hall, "The Spirituality of the Covenant: Imaging God, Stewarding Earth," *Perspectives* (December 1988): 11–4.

[8]John R. Wood, "Biophilia and the Gospel: Loving Nature or Worshipping God?" in *Living in the LambLight: Christianity and Contemporary Challenges to the Gospel*, ed. Hans Boersma (Vancouver: Regent College, 2001), 153–76.

[9]Kenneth R. Young and Karl S. Zimmerer, eds., *Nature's Geography: New Lessons for Conservation in Developing Countries* (Madison, WI: University of Wisconsin Press, 1998).

[10]See Susan Bratton, "Loving Nature: Eros or Agape?" *Environmental Ethics* 14 (Spring 1992): 3–24; Janel Curry-Roper, "Recovering a Covenantal Sense of Place," *Perspectives* (June/July 1999): 8–10; Steven Bouma-Prediger, *For the Beauty of the Earth: A Christian Vision for Creation Care* (Grand Rapids, MI: Baker Academic, 2001); Brueggemann, *The Land*; and John Inge, *A Christian Theology of Place* (Aldershot: Ashgate, 2003).

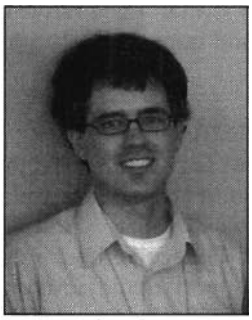


**Article**

*Nature, Technology and the* Imago Dei*: Mediating the Nonhuman through the Practice of Science*

# Nature, Technology and the *Imago Dei*: Mediating the Nonhuman through the Practice of Science

*Bret Stephenson*



**Bret Stephenson**

*In this article, I seek to question the role of technology, primarily as it is employed in scientific practice, in the mediation between humans created in the image of God and the nonhuman creation. I accept the position that human personhood cannot be separated from our relationship with the multiplicity of nonhumans with whom we share this realm of creation. Moreover, I seek to uncover the positive aspects of a technological mediation which participates in our increasingly technologized personhood. This study draws heavily on the work of Actor-Network Theorists (ANT) such as Bruno Latour and John Law, and Trinitarian theologians such as Colin Gunton, in an effort to open up an interdisciplinary dialogue among theological anthropology, the doctrine of creation, and these fascinating sociological accounts of the technological practice of science.*

*The traditional understanding of the imago Dei is taken to be essentially* individualist *and* dualistic ...

Today it is quite common to find questions concerning the mystery of the human person wrapped up in the complex webs spun by the sciences and their technological practices. Debates surrounding genetic engineering, neurobiology, ecology, politics, and sexuality all carry the underlying question: What is it to be a *human* being? Moreover, what is it to be a human in the face of the Other: other humans, nonhumans, and God? Many of the recent theological responses to this issue have sought to speak specifically to bioethics, eschatology, or artificial intelligence. But in this paper, I will seek to bring theological anthropology into conversation with some of the recent currents in the growing field of science studies, particularly the work of Bruno Latour. Part anthropologist, part sociologist, and part philosopher, Latour has built a career out of tracing the human, nonhuman, and technological networks which scientific practice inevitably produces and negotiates in the interest of bringing the world—that is the nonhuman world—into human political discourse. Before turning to Latour's account of technological action, I first will review some of the recent currents within theological anthropology while seeking to identify one of its major blindspots. When speaking of the human person in a theological context, we are never far from those peculiar words from the first chapters of Genesis which refer to humans being created in the image of God.

## Locating the *Imago Dei*

### *The Traditional Individualist Account*

Though the phrase "image of God" appears no more than three times in the Hebrew Bible, it has become the centerpiece of reflection concerning the Christian understanding of the human person. Christian doctrine concerning the human imaging of God, or the *imago Dei* as it is known, has experienced repeated revision throughout the Christian tradition. But as many recent studies have shown, the *imago Dei* all too often has been associated with internal and ultimately static qualities of the human mind, namely a disembodied rationality.[1]

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The many problems associated with this static, internal, and individualistic understanding of the *imago Dei* have been well documented, but here I will rehearse just a few which have been outlined by Colin Gunton, a Trinitarian theologian. First, it has been widely remarked that by understanding the image as rationality we have precluded other equally, if not more important, aspects of the human person. And secondly, by emphasizing the internal mental characteristic of human reason, the tradition has largely accepted the idea that "we are more minds than we are bodies."[2]

The deeply detrimental impact this understanding of the human person would have on the modern era can scarcely be overstated. Reshaped in Descartes' *cogito* and Kant's Transcendental Ego, the disembodied rational person of the modern era was nothing more than a "science-fiction nightmare" – to use Latour's revealing expression – as we had now lost touch with our material embeddedness in a very real material world.[3]

In sum, the traditional understanding of the *imago Dei* is taken to be essentially *individualist* and *dualistic* as it gives little, if any, importance to the many relationships which constitute human persons in their own particular being. Although it served to give some account of where humanity stood between God and nonhuman creatures, the traditional individualist account carries no appreciation of the complex relationality which exists among God, humans, and the nonhuman creation.

## The Relational Turn

It is for this reason that much of the recent theological reflection on the image of God has sought to reinterpret the image, not as an individually held static quality of the mind, but as a relational achievement which is constituted between others-in-relation.[4] The direct theological model for this type of relationality is analogically derived from the dynamic, or *perichoretic*, relationality found at the very heart of God's dynamic and triune being. Thus it is with the recently rekindled interest in Trinitarian theology, or the "Trinitarian renaissance" as it has become known, that specifically relational concepts have been appropriated for theological anthropology.

The work of John D. Zizioulas, a Greek Orthodox theologian, has been of particular importance in the popularization of this relational turn.[5] His overall contribution has drawn much of its direction from patristic theology, but particularly that of the Cappadocian Fathers: Basil the Great, Gregory of Nyssa, and Gregory of Nazianz. And although his theological anthropology finds its ultimate form in ecclesiology – that is, the communal being of persons gathered in the body of Christ – it first forms its basis in a relational ontology of the person drawn directly out of theological reflection on the nature of God's triune being. For Zizioulas, the Cappadocian fathers represent a revolution in their understanding that God's being (*ousia*) is an essentially relational achievement among the three persons (*hypostasis*) of the Trinity: Father, Son, and Holy Spirit. Therefore, the unified being of the One God is only to be found in the relational communion of the three persons. Thus *being* or *substance* is now the outgrowth of an ontologically prior *relationship*.

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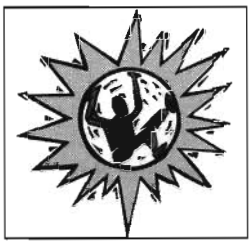
This ontological revolution ushered in by the Cappadocians is presently thought by many to provide our basis for understanding human personhood in similar fashion to that of the divine persons of the Trinity. And importantly, this new and specifically Christian ontology of the person stands in stark contrast to the *individualistic* and *dualistic* anthropology of the Greek philosophers. In Greek ontology, which produced the dualistic interpretation of the *imago Dei* we reviewed earlier, individual substances always preceded relation. In this sense, relations are what happen between already constituted individual substances. Personhood was thought to be a prefabricated and God-like or spirit-like substance that was merely added to our material bodies as if it were an afterthought. But in a fully Trinitarian understanding of personhood, we find that it is our embodied relationality which constitutes our being. We are, in fact, *nothing* if not for the relationships in which we exist.

This turn to a relational understanding of the *imago Dei*, built as it is on a relational understanding of God's triune being, raises the problem of now describing and cataloging the varieties of relationship in which, and through which, we are ontologically composed as human persons. British theologian Colin Gunton has produced several books and articles addressing this very question from a rigorously Trinitarian perspective. In the final analysis, he identifies three major forms or types of relationality which serve to compose the being of human persons.



# Article

*Nature, Technology and the* Imago Dei: *Mediating the Nonhuman through the Practice of Science*

*[Recent relational theological anthropologies] threaten to draw us back into many of the pitfalls which were produced by the traditional and individualist accounts of the* imago Dei. *What is needed is a detailed account of the intimate relationality, or commerce that exists between humans and nonhumans.*

The first relationship belongs to the "vertical" trajectory. Here Gunton argues that we are persons only as we exist in relation to the Triune God, but particularly through the Son and the Spirit—the right and left hands of God.[6] As the "archetypal bearer of the image," it is through the Son and by the agency of the Spirit that we are made to image God in the first instance.[7] The second and third relationships fall under the "horizontal" trajectory, yet Gunton will argue that it is important that we see these "horizontal" relations taking their distinctive shape as the outgrowth of the ontologically prior relationship with Christ through the work of the Spirit. The first of these horizontal relationships has to do with what we might call *social* relationality. The social element teaches us that we reflect the *imago Dei* in that humans are ontologically established in community with other persons. In the third and final form of relationality, we learn that the human is constituted through its embodied relations with the "non-personal"—Gunton's term—or nonhuman world. The relationship is, however, asymmetrical as the nonpersonal or nonhuman world is understood to be ontologically and eschatologically dependent upon humanity. Being created in the image of God, humans carry the "responsibility to offer the creation, perfected, back to its creator as a perfect sacrifice of praise."[8]

We now can identify something approaching a kind of hierarchy of relationships which develops within Gunton's theological anthropology. The first and privileged relationship belongs to the "vertical" human-God relationship. This form of relationality is, for Gunton, both ontologically and methodologically prior to all other forms of relationality as it is through relationship with the triune God that our relational and distinctively human personhood is revealed. Secondly, the "horizontal" human-human relationship (the social), is similarly ontologically prior to the human-nonhuman relationship. In sum, we primarily are constituted through our relationship to God, and then to a lesser degree through our inter-human relations, and least of all through our relations with the nonhuman realm.

One finds similar hierarchical formulations in the work of Zizioulas and that of Christoph Schwöbel,[9] each of whom bases his relational theological anthropology upon a comparison of divine and human personhood. And although the relational and Trinitarian turn in theological anthropology has freed us from many of the problems associated with the traditional understanding of the *imago Dei*, they have largely failed to give any detailed account of the dynamic commerce which exists between humans and the multiplicity of nonhumans with whom we share our daily lives—a point recently made in an important article by Edward Russell.[10]

This is surely not to say that there is no weight given to human-nonhuman relations in these recent relational theological anthropologies. The issue here, as it is for so many other theological problems, is one of emphasis. For instance, by emphasizing the continuities between human and divine persons, and the discontinuities between humans and nonhumans, these anthropologies have served to further sever human sociality from nonhuman materiality. Or stated in what are, perhaps, more familiar terms, they threaten to further separate nature and society into an even more pronounced dichotomy. In a very real sense, they threaten to draw us back into many of the pitfalls which were produced by the traditional and individualist accounts of the *imago Dei*. What is needed is a detailed account of the intimate relationality or commerce that exists between humans and nonhumans. These horizontal relationships are, or rather should be, just as important to a theological anthropology as the detailing of continuities between divine and human persons.

## Bruno Latour on Technological Mediation

It is on this point that I believe a theological engagement with the field of science studies, or science and technology studies (STS) as it is sometimes called, would be of tremendous benefit. Here I would like to briefly focus on one of the most successful fields, a methodological offspring most commonly known as Actor/Actant-Network Theory (ANT).[11] Although it is more of an academic "style" than it is an academic "theory," ANT employs a relational ontology which is surprisingly similar to the relational anthropologies now populating Trinitarian theology, with the one exception, that the actor/actant-network style does not limit relationality or the ability to initiate relationships—otherwise known as *agency*—to the human

or subjective sphere alone. In fact, Bruno Latour and a number of other ANT theorists, have argued that the term "agency" has lost its usefulness in the tracing of networks that consist of multiple human, nonhuman, and technical actors. Therefore, in order to avoid the strong tendency of the social sciences to reserve agency for human actors alone, ANT has largely adopted the alternative term of "actant." As John Law has explained, ANT "is a ruthless application of semiotics. It tells that entities [both human and nonhuman, technological and artificial] take their form and acquire their attributes as a result of their relations with other entities."[12]

It is in this way that Latour can speak of "socialized nonhumans" or "quasi-objects." For at the heart of ANT lies the radical suggestion that the modern dichotomies of society and nature, subjects and objects, realism and idealism were nothing more than a political settlement cemented into the philosophical and theological framework of the modern era—what Latour calls the "modern Constitution."[13] Latour has repeatedly suggested that we certainly do not live in purely human societies, and similarly that nature has not escaped socialization. Therefore, we should largely jettison these polemic terms—Nature and Society—and instead speak of *collectives* made up of numerous associations, or networks, of human and nonhuman actants. Thus, rather than to try to heal the divisions between the two poles of the modern settlement—Nature on one side and Society on the other—ANT seeks first to reduce all entities to the status of mere *humans* and *nonhumans*. These terms, it is argued, do not carry the political, philosophical, or epistemological baggage of the polemically opposed subjects and objects of the modern Constitution. Moreover, terminology such as this helps to remind us that we share our social worlds with countless nonhumans without whom social complexity simply would not exist.[14]

We also must recognize that in the actor/actant-network approach all a priori ontological distinctions are done away with—subjects/objects, structure/agency, knowledge/belief, mind/body—all dualisms are dissolved into heterogeneous networks and redistributed amongst the vibrant relationships between human and nonhuman actants. In ANT—as it is with Latour's work as a whole—essences, ontologies, divisions, distinctions, and even *agency/actancy* are always the *result* of work, practice, relations, and actions that are mediated along heterogeneous associations of humans and nonhumans. This is what John Law and others have called the "relational materiality" or the "semiotics of materiality" of the ANT approach(s). It is in this sense that science studies seeks to place itself within the "non-place" or the "black-box" which the modern settlement so readily produced by purifying the natural and social realms into opposite poles. The ANT theorist will now seek to trace out the multiple constellations of mediations that exist between the two realms. That is, science studies seeks to follow the hybrid networks which transgress the fictional abyss opened up by the modern's "Constitution."

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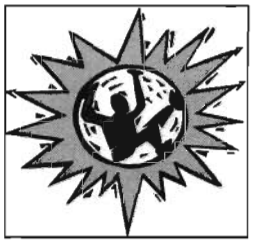
This is not to suggest that the actor/actant-network style is incapable or unwilling to find stable and fully formed humans and nonhumans populating the world. This has been a concern raised amongst ANT's critics that if all reality is merely the oscillating exchange of properties up and down networks of relationality, then nothing truly *is*.[15] That is, *nothing* or *no one* is ever ontologically stable enough to constitute a particular and concrete being. All reality is thought to be reduced to a homogeneous whole. But certainly this is not the position argued by the ANT theorist. Instead, what the actor/actant-network style seeks to avoid is the black-boxing, or the obfuscating of relations once entities or network effects become stable. This has been the temptation in so much social, theological, philosophical and scientific theory. Once we have identified a stable entity—be it a person or thing, Robert Boyle's vacuum, Louis Pasteur's bacteria, holes in the ozone, or BSE causing prions—we quickly black-box, or make opaque, all the relations and agencies, humans and nonhumans, sometimes distant in both time and space, which have served to construct and sustain an entity in its particular being.

Now in order to further understand this "material relationality," which is at the heart of the ANT approach, we will need to consider Latour's position concerning technological mediation and scientific practice. For Latour the "essence of a technique" is to be found in "the mediation of the relations between people on the one hand and things and animals on the other."[16] In this sense, the linkages between humans and nonhumans cannot be understood unless we redefine the traditional *homo faber* myth





*Human sociality, as we know it, would be an impossibility if not for the multiplicity of nonhumans with whom we share our collectives. This is a point which, Latour argues, has largely been lost within mainstream sociology. And I would add, within mainstream theological anthropology.*

of technological action. In this sense, techniques do not give us unmediated or unsocialized access to objective matter or nature that is "out there" beyond the social and subjective realm.[17] Therefore, we must jettison the idea that techniques or artifacts are nothing more than the imposition of preplanned human "mental images" on an entirely passive and shapeless matter. For this traditional *homo faber* myth serves only to reinforce the mind-matter dualism which we reviewed earlier. Instead technological actions should be understood as the process of socializing nonhumans, or bringing nonhumans into our collective existence as full social actors.[18]

In the past, scientific practice was rationalized by stressing the two extremities of Mind "inside" and World "out there." Once again we are reminded of the traditional understanding of the *imago Dei* as internal and disembodied rationality—or a "brain-in-a-vat" as it is sometimes called. But now armed with an understanding of technological action as the folding of human and nonhuman properties, scientific practice may take on a very different locus. Through the detailed study of scientific practice, "the humble instruments, tools, visualization skills, writing practices, focusing techniques, and what has been called 're-presentation'" now occupy the middle ground which the moderns made opaque with their dichotomization of the realms of Nature and Society.[19] Never does scientific knowledge come to our minds unmediated as if by mere contemplation. Knowledge instead is mediated through a cascade of techniques, inscriptions, and instruments. That is, it is *materially* mediated. And material mediation is what the sciences are so wonderfully good at carrying out with great precision.

It is through the technological and material mediation of the sciences that the "gap"—posited by the moderns and their dichotomizing Constitution—between representing mind and the represented world is bridged, and the world comes to us, and is incorporated into our collectives, and ultimately becomes more *real*. But as Latour reminds us: "We should never take our eyes off the material weight of this action."[20] We should never allow ourselves to forget the millions of mundane nonhuman artifacts which are the lifeblood of the sciences and social stability as a whole. For it is one of ANT's central claims that technology is society made stable in space and through time.[21] Human sociality, as we know it, would be an impossibility if not for the multiplicity of nonhumans with whom we share our collectives. This is a point which, Latour argues, has largely been lost within mainstream sociology. And I would add, within mainstream theological anthropology.

## Conclusion

The purpose of this paper has been to encourage dialogue between Christian scholars and the growing field of science and technology studies. Many Christian scholars, it seems, have grown all together too defensive in the face of what are thought to be "postmodern," "relativist," or "social constructivist" approaches to the philosophy of science, or the sociology of knowledge.[22] In fact, Latour often has been the recipient of these charges, but seldom with sufficient cause. To label Latour's work as "postmodern" is at best misleading. As Steven C. Ward has remarked, Latour's work represents an "attempt to offer a view of science that is void of both modern realist optimism and postmodern relativist pessimism. As such, it is neither a realist vindication of the progress of science or an antirealist denigration of all foundations."[23]

It is similarly misleading to characterize ANT, but specifically Latour's employment of the style, as adhering to a "social constructivist" account of scientific knowledge. Although Latour will himself describe his approach as being one that is "constructivist," this is a far different constructivism to what is commonly implied by the terms "social construction." Latour recently has proposed the term "compositionism" to get away from the "social" connotations now indelibly adhered to the term "construction."[24] For the ANT theorist, knowledge *is* constructed. It is composed of heterogeneous networks populated with numerous human and nonhuman actants. But never are these compositions to be viewed solely in "social" terms.

Finally, I would like to make clear that my purpose here is not to suggest that Christian theologians should adopt ANT or Latour's wider body of work uncritically. In

fact, there are a number of points where the critique could be effectively turned around, as it is surprising how often Latour's work ventures into questions that require theological reflection.[25] For instance, one can find peppered throughout Latour's work a certain interest in a pantheistic understanding of the God-world relationship, drawn largely from a Whitheadian or process understanding of God's interaction with the creation.[26] A pantheistic vision, of course, would be antithetical to much of the recent Trinitarian thought which takes as one of its central concerns the preservation of otherness-in-relation between Creator and creation. And this is just one of several points where Trinitarian theology can speak to the Latourian project with great effectiveness.

But to conclude what has been an all too brief summarization of the ANT approach, we may still discern a clear similarity with the relational ontology now popular in Trinitarian theology. In actor/actant-network theory, the *being, substance,* or *essence* of an entity does not precede its networked relations. This is a point very similar to that of the Cappadocian fathers who found God's being to be the result, or the outgrowth, of the ontologically prior relations amongst the three persons of the Trinity. Yet unlike the relational anthropologies we reviewed earlier, the actor/actant-network approach does not limit *actancy* to human actors alone. Action is always a relational achievement amongst both humans and nonhumans. Moreover, in the ANT approach, human being and human sociality are impossibilities without the multiplicity of socialized nonhumans who mediate relations and lend stability to human sociality. Latour, and ANT as a whole, have fundamentally questioned the ability of humans to be persons without the multiplicity of nonhumans with whom we share our collective existence. This is a point to which I believe Trinitarian theologians must now give deep consideration. ✦

## Acknowledgment

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## Notes

[1]F. LeRon Shults, *Reforming Theological Anthropology: After the Philosophical Turn to Relationality* (Grand Rapids, MI: Eerdmans, 2003); Christoph Schwöbel and Colin E. Gunton, eds., *Persons, Divine and Human: King's College Essays in Theological Anthropology* (Edinburgh: T&T Clark, 1991); David A. S. Ferguson, "Towards a Theology of the Personal," in *The Presumption of Presence: Christ, Church and Culture in the Academy. Essays in Honor of D. W. D. Shaw,* Peter McEnhill and George B. Hall (Edinburgh: Scottish Academic Press, 1996).

[2]Colin E. Gunton, "Trinity, Ontology and Anthropology: Towards a Renewal of the Doctrine of the *Imago Dei*," in *Persons, Divine and Human,* 48.

[3]Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999), 6.

[4]Recent examples of this relational approach to theological anthropology include John D. Zizioulas, *Being as Communion: Studies in Personhood and the Church* (New York: St Vladimir's Press, 1985); Douglas John Hall, *Imaging God: Dominion as Stewardship* (Grand Rapids, MI: Eerdmans, 1986); and Miroslav Volf, "The Trinity is Our Social Program: The Doctrine of the Trinity and the Shape of Social Engagement," *Modern Theology* 14, no. 3 (July 1998). For an overview of the philosophical and theological precursors to the trend, see Shults, *Reforming Theological Anthropology.*

[5]Zizioulas, *Being as Communion;* ——, "On Being a Person: Towards an Ontology of Personhood," in *Persons, Divine and Human.*

[6]Gunton has adopted this terminology and much of his own theology of mediation from Irenaeus of Lyon. See, for instance, Colin E. Gunton, *The Triune Creator: A Historical and Systematic Study* (Edinburgh: Edinburgh University Press, 1996), 54.

[7]——, "Trinity, Ontology and Anthropology," 58–9.

[8]Ibid., 60. For Gunton, the nonhuman (in his terms "non-personal") creation depends upon the human (personal) creation in order to fulfill its destiny of praising the Creator. Referencing Rom. 8:19, Gunton argues that the nonhuman creation "requires persons [humans] in order to be itself" (p. 56). It is through our participation in the divine image that we are capable of participating in this perfecting of creation and offering it in praise to the Creator.

[9]Christoph Schwöbel, "Human Being as Relational Being: Twelve Theses for a Christian Anthropology," in *Persons, Divine and Human,* 141–65.

[10]Edward Russell, "Reconsidering Relational Anthropology: A Critical Assessment of John Zizioulas's Theological Anthropology," *International Journal of Systematic Theology* 5, no. 2 (July 2003). Russell takes particular issue with Zizioulas's tendency to diminish what he calls the "biological being" of the human person.

[11]Latour has recently suggested that the name Actor-Network Theory is misleading on many levels and has instead recommended that "actant-rhizome ontology" may be a better-suited namesake. See Latour, "On Recalling ANT," in *Actor Network Theory and After,* John Law and John Hassard (Oxford: Blackwell, 1999), 19.

[12]John Law, "After ANT: Complexity, Naming and Topology," in *Actor Network Theory and After,* 3.

[13]Bruno Latour, *We Have Never Been Modern,* trans. Catherine Porter (New York and London: Pearson Education Ltd., 1993).

[14]For more on this important claim, see Bruno Latour, "Where are the Missing Masses? The Sociology of a Few Mundane Artifacts," in *Shaping Technology/Building Society: Studies in Sociotechnical Change,* Wiebe E. Bijker and John Law (Cambridge, MA: MIT Press, 1992); ——, "Technology is Society Made Durable," in *A Sociology of Monsters: Essays on Power, Technology and Domination, Sociological Review Monograph* 38, John Law (London and New York: Routledge, 1991).

[15]Nick Lee and Steve Brown, "Otherness and the Actor Network: The Undiscovered Continent," *American Behavioral Scientist* 37 (1994).

[16]Bruno Latour, "A Door Must be Either Open or Shut: A Little Philosophy of Techniques," in *Technology and the Politics of Knowledge,* Andrew Feenberg and Alistair Hannay (Bloomington, IN: Indiana University Press, 1995), 272.

[17]——, "Pragmatogonies: A Mythical Account of How Humans and Nonhumans Swap Properties," *American Behavioral Scientist* 37 (1994): 2.

[18]But we must also recognize, as Latour argues, that human artifice always escapes us. Rarely, if ever, do we directly impress our "internal" mental image onto passive matter. The nonhuman materials which are necessary to technical action always participate in their own making. The material is, in a sense, a co-creator,

a co-agent in the process of making. We humans simply do not act on our own as if by *creatio ex nihilo*. See Latour, "Pragmatogonies."

[19]Bruno Latour, "How to be Iconophilie in Art, Science and Religion," in *Picturing Science-Producing Art*, Caroline A. Jones and Peter Galison (New York and London: Routledge, 1998), 2.

[20]____, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999), 49.

[21]____, "Technology is Society Made Durable."

[22]To varying degrees the following recent articles have expressed something of this concern although without mentioning Latour's work specifically: Kennell J. Touryan, "Are Truth Claims in Science Socially Constructed?" *Perspectives in Science and Christian Faith* 51, no. 2 (1999): 102-7; John L. Taylor, "The Post Modern Attack on Scientific Realism," *Science and Christian Belief* 14 (2002): 99-106; Donald A. Carson, "Maintaining Scientific and Christian Truth in a Postmodern World," *Science and Christian Belief* 14 (2002): 107-22.

[23]Steven C. Ward, *Reconfiguring Truth: Postmodernism, Science Studies, and the Search for a New Model of Knowledge* (New York: Rowman & Littlefield, 1996), 133.

[24]Bruno Latour, "The Promises of Constructivism," in *Chasing Technoscience*, Don Ihde and Evan Selinger (Bloomington, IN: Indiana University Press, 2003), 40.

[25]These intermittent reflections on theological ponderings become less surprising when one considers that Latour began his academic career as a student of biblical exegesis before moving on to sociology and science studies.

[26]See, for instance, Latour's "Whitheadian" claim that God is overtaken by "His Creation" *Pandora's Hope*, 283. Suggestions of a "God of below" approach to the God-world relationship can also be found throughout *We Have Never Been Modern* (p. 77), but also in Latour's *War of the Worlds: What about Peace?* trans. Charlotte Bigg, ed. John Tresch (Chicago: Prickly Paradigm Press, 2002).

*News Release*

## Randall D. Isaac Accepts Directorship of the American Scientific Affiliation

RANDALL D. ISAAC

The ASA is pleased to announce the appointment of its new executive director, Randall D. Isaac.

Randy has a wealth of experience as a manager, most recently as IBM Research Vice President of Systems, Science, and Technology.

An ASA member since 1976 and an ASA fellow since 1996, Randy is committed to the integration of science and theology.

On February 1, 2005, Randy began volunteer, part-time duties. He assumes full-time responsibilities August 1, 2005. Randy can be reached by email: Randy@asa3.org

Welcome, Randy!

# BOOKS RECEIVED AND AVAILABLE FOR REVIEW

Contact the book review editor if you would like to review one of these books. Please choose alternate selections. Richard Ruble, Book Review Editor, *Perspectives on Science and Christian Faith*, 212 Western Hills Drive, Siloam Springs, AR 72761. **New e-mail address**: richardanne@cox-internet.com

Nigel Barber, *Kindness in a Cruel World: The Evolution of Altruism*, Prometheus Books, 415 pages, 2004

William Cleary, *Prayers to an Evolutionary God*, Skylight Paths, 182 pages, 2004

Michael Guillen, *Can a Smart Person Believe in God?* Nelson Books, 165 pages, 2004

William Hutton and Jonathan Eagle, *Earth's Catastrophic Past and Future: A Scientific Analysis of Information Channeled by Edgar Cayce*, Universal Publishers, 572 pages, 2004

G. D. Kaufman, *In the Beginning ... Creativity*, Fortress Press, 152 pages, 2004

Alan Lightman, *A Sense of the Mysterious: Science and the Human Spirit*, Pantheon Press, 210 pages, 2005

Marvin Lubenow, *Bones of Contention: A Creationist Assessment of Human Fossils*, Baker Books, 400 pages, 2004

Michael Mallary, *Our Improbably Universe: A Physicist Considers How We Got Here*, Thunder's Mouth Press, 227 pages, 2004

Peter Russell, *From Science to God: A Physicist's Journey into the Mystery of Consciousness*, New World Library, 130 pages, 2005

E. C. Scott, *Evolution vs. Creationism: An Introduction*, Greenwood Publishing Group, 272 pages, 2004

Russell Stannard, *Science and the Renewal of Belief*, Templeton Foundation Press, 228 pages, 2004

Mikael Stenmark, *How to Relate Science and Religion*, Eerdmans, 290 pages, 2004

Richard Thompson, *God and Science: Divine Causation and the Laws of Nature*, Govardhan Hill Publishing, 216 pages, 2004

Edward Wilson, *On Human Nature*, Harvard University Press, 260 pages, 2004

# Place-Based Agriculture: Christian Environmentalism Informing Collaborations in Agroecology & Biotechnology

*David S. Koetje*

*To improve food security and environmental sustainability, it is imperative that we follow a paradigm for agricultural research and policy-making rooted in the places we seek to sustain. Place encompasses the ecological and cultural contexts of human enterprises. Appropriate technologies can enhance the resilience of places. However, place is ignored in the prevailing paradigm of industrial agriculture, eroding the cultural and ecological interrelationships upon which agriculture depends. To reverse this trend, we need to develop place-based agricultural systems attuned to the ecology of local bioregions, to the needs and knowledge of local communities, and to the cultural values of precaution, care, and restraint. This new paradigm emerges from a Christian environmental perspective that engages agricultural biotechnology toward the goal of promoting cultural and ecological resilience. In this way, agroecology and biotechnology can collaborate to enhance global food security and ecological sustainability.*

David S. Koetje

*Sense of place helps us to realize that complex webs of environmental and cultural interactions matter a great deal in agriculture.*

While most farmers have always paid at least some heed to their cultural and ecological contexts (i.e., their place), agrarian (organic and sustainable agriculture, or agroecology) farmers typically are more keenly attuned to place. A concept gaining prominence in environmental philosophy and science,[1] sense of place helps us to realize that complex webs of environmental and cultural interactions matter a great deal in agriculture.[2] A growing number of consumers concur, spurring organics as the fastest-growing food sector in North America.[3] Unfortunately, place is still deemed irrelevant in industrial agriculture and agricultural biotechnology (agbiotech),[4] where the focus is still on intensive monocultures grown with little respect to place. Most stakeholders in this system are seemingly unaware of ecological literature demonstrating that species-rich ecosystems (such as polycultures) are more resilient to environmental stress.[5] To their credit agbiotech scientists are working to develop transgenic plants with improved environmental stress tolerance, knowing that stress limits crop yields.[6] However, most are failing to incorporate the underlying causes of environmental instability into their solutions. They will claim that this is not their responsibility. As an unintended consequence, the global industrial food system often undermines the resilience of cultural and ecological systems upon which agriculture depends.

In other words, when place is ignored food systems become increasingly vulnerable to crop losses, social discord, and market instabilities. Biotic stress (e.g., pests and pathogens) and abiotic stress (e.g., weather

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*Place-Based Agriculture: Christian Environmentalism Informing Collaborations in Agroecology & Biotechnology*

*Until agbiotech undergoes a paradigm shift, it is likely to contribute little to global food security and ecological sustainability. Conforming to the norms of place-based agriculture – focusing primarily on farming concerns at a bioregional scale – will promote thriving, resilient food systems.*

extremes, mineral deficiencies/toxicities, and pollution) together reduce average crop productivity by 65–87%.[7] These forms of crop stress are often exacerbated by agricultural intensification: abandoning or simplifying crop rotations, removing field boundary habitats (which act as refuges for beneficial insects and birds) to make way for larger machines, breeding for crop uniformity and yield, relying heavily on fertilizers and pesticides, and intensively irrigating crops.[8] Social discord invariably ensues when corporations announce their intentions to set up large-scale livestock operations (e.g., industrial hog or poultry production facilities) in rural communities.[9] Communities are often split over the social and environmental costs versus the potential economic benefits. In reality, such corporations contribute very little to the community, culturally or economically.[10] The potential for market instabilities is exacerbated by agribusiness consolidation of economic power, which is occurring in both conventional and organic food sectors. When a handful of corporations – ADM, ConAgra, Cargill, and a few others – collectively control more than half of the market share at critical steps in the food system "from seed to shelf," then rural infrastructures and local economies erode – even collapse.[11]

Not recognizing the implicit interconnections between food and places, agbiotech and industrial agriculture proponents tend to overlook the broader social implications, such as globalization, stratification of power, ethics, equity, individual rights, and choice.[12] Instead, policy questions about the efficacy of genetically modified (GM) foods typically focus on narrowly-defined health and environmental safety issues.[13] In attributing the outcry against GM crops to public mistrust of food safety regulators, they fail to recognize that these concerns arise because food has deep cultural significance, heightening opponents' furor.[14] To manipulate food is to run the risk of tampering with our social fabric.

Most profoundly, by failing to come to grips with the importance of place, the agbiotech industry has alienated itself from a potential ally – agrarian agriculture. In fact, the two systems are currently on different ideological tracks (Table 1).[15] Developed by agricultural scientists schooled mainly in industrial agriculture, current GM crops primarily boost farm profits by reducing inputs. Environmental benefits are a secondary good. Likewise, the profit motive underlies the development of second generation GM crops, which promise health benefits to consumers. Agriculture needs to be profitable, of course. But given the contrasting paradigms, is it any wonder that biotechnology is currently considered anathema in

**Table 1. Clashing Paradigms in Modern Agriculture**

| Industrial Agriculture | Agrarian Agriculture |
|---|---|
| Modernist worldview<br>• nature as machine<br>• human sovereignty | Romantic worldview<br>• nature as organism<br>• sovereignty of nature |
| Reductionistic | Holistic |
| Econocentric (anthropocentric) | Ecocentric (non-anthropocentric) |
| Utilitarian ethic | Care theory |
| Global economy | Local economy (foodshed) |
| Social & ecological risks<br>• intensification<br>• mechanization | Crop management risks<br>• environmental stresses reduce quantity, quality |
| Exuberant about agbiotech | Wary of agbiotech |
| Scientific risk assessment | Precautionary principle |
| Maximizing productivity & profitability | Sustaining productivity & enhancing biodiversity |
| Policies should distribute rights to individuals | Policies should promote social & ecological wellbeing |

agrarian agriculture? Agrarian farmers have traditionally engaged in their enterprise out of a deep conviction that ecological interrelationships particular to places are paramount in sustaining agricultural productivity. Technologies are adopted only if they are appropriate for a given ecological and cultural context. Profits are secondary to a kind of kinship between people and the land. This is why those who espouse this ideology are willing to pay a premium for organic foods.

Agricultural biotechnologists typically justify their cause by appealing to the long history of human manipulation of crop genomes through seed selection and conventional breeding. GM crops, they argue, are just an extension of human manipulations that have gone on for millennia. Furthermore, GM crops are needed to fend off hunger and produce crops in a more environmentally-friendly manner. While these arguments have merit when viewed from a reductionistic perspective, they lose some of their punch when viewed through a wider lens. Anthropologist Glenn Davis Stone counters convincingly that hunger is due not to food shortages, but to unjust socio-economic structures and policies.[16] These clearly must be addressed as an integral component of agriculture. But the question remains of how to feed the anticipated 8–10 billion people expected by 2050 while protecting ecosystems. Solutions will require the concerted efforts of agro-ecologists and biotechnologists. However, most biotechnologists and industrial agriculturists do not yet recognize the root of the problem: the loss of contextual perspectives erodes our ability to judge what technologies and practices are appropriate to a given place. Therefore, until agbiotech undergoes a paradigm shift, it is likely to contribute little to global food security and ecological sustainability. Conforming to the norms of place-based agriculture—focusing primarily on farming concerns at a bioregional scale—will promote thriving, resilient food systems.

## Advocating Change

My vision for place-based agriculture is rooted in Christian environmentalism, which recognizes creation as fundamentally interrelational—a *perichoresis*.[17] In sharp contrast to today's individualism that fosters fragmentation and alienation in our global food system,[18] nurturing of cultural and ecological interrelationships is the standard by which we judge the efficacy of technologies and policies in place-based agriculture. This requires that values be considered up front, as a means to inform science and practice.[19] It requires deeper levels of reflection and humility in our public discourse—especially in discussing scientific claims and world views. It also requires re-evaluation of some fundamental assumptions concerning economics, technology, and social theory. Can we reverse globalization's ill-effects that sever interconnections among land, farmer, and consumer, or should we commit to develop more locally-based food systems? Should we dismiss agbiotech on the basis of the claim that it is unnatural,[20] or can we adapt it to restore or enhance cultural and ecological relationships? There is nothing particularly Christian about the prevailing industrial mode of agriculture (Table 1). Place-based agriculture, therefore, offers an opportunity for Christians to advocate needed reforms.

*My vision for place-based agriculture is rooted in Christian environmentalism, which recognizes creation as fundamentally interrelational ...*

As both a Christian environmentalist and biotechnologist, I am in rare company. Taking agbiotech into consideration makes most environmentalists very uneasy; yet I believe there are compelling reasons for carefully investigating biotechnology applications in place-based agriculture. Moving genes from one kingdom to another is one extreme within the realm of possibility afforded by biotechnology. If moving a flounder gene into a strawberry could enhance cold tolerance in the plants, should we do it? Certainly we should not do so callously, just because we can or because we find evidence of trans-kingdom gene flow in nature. But if transgenic crops with enhanced cold tolerance could better support local food systems in cool climates, could we not consider adopting them? If we rule out inter-kingdom gene transfers, would we consider transferring genes between species that are close relatives? The spread of transgenes to a wild relative or to non-GM fields of the same crop is a big concern, yet non-GM crops are just as capable of spreading "genetic pollution" via intra- and interspecies pollination. If genetic technologies can be developed to help prevent this,[21] would it not be important to adopt them judiciously to protect the integrity of native ecosystems? Biotechnology also encompasses non-GM tools for plant tissue culture (a type of vegetative propagation) and genetic marker-assisted breeding. Since these are akin to accepted means of asexual and sexual propagation, why not make careful use of them?

Should we accept animal biotechnology? Livestock cloning, genetic modification, and patenting are very controversial; the issues, extremely difficult. Dieter Hessel, director of the ecumenical Program on Ecology, Justice and Faith, argues:

> Something analogous to "just war" criteria are needed to guide biotechnical efforts to manipulate animals. Such ethical criteria would put the burden of proof on those who would intervene drastically in

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*In place-based agriculture, we chiefly are concerned about the cultural and ecological characteristics of a particular bioregion – or foodshed. Our goal is to develop technologies that are appropriate, that match the needs and cycles of that place in a way that is resilient – that is, promoting ecological and cultural sustainability.*

> nature to alter species or to proceed in ways that place ecosystems at risk.[22]

While animal biotechnology must be approached with due caution, I contend that it could be appropriate for place-based agriculture. It may be helpful, for example, in minimizing the exchange of pathogens and parasites between livestock and wildlife, or as a supplement to breeding programs in restoring desirable instinctive behaviors compromised by domestication and intensification. But before we attempt to apply such solutions, we must agree to practice agriculture and agbiotech in a way that is "sensitive to the 'expectations of the land' and replaces the universalizing perspectives of agricultural science that treats all places the same."[23]

If we accept agbiotech in place-based agriculture, then toward what ends should we attempt to develop it? We live in a diverse world as creatures of God, fellow sojourners with all of creation. But the world we live in is tainted with the effects of our fall into sin. While the Bible does not spell out what the full ramifications of the Fall are, it clearly teaches that our relationships to God, to other parts of the creation, and to each other are corrupted. These relationships could only be made right again through the redemptive work of Jesus Christ. But this did not immediately restore everything. By God's grace we can now participate in that work whose goal is shalom, liberating the creation from sin's effects so that it can function as God first intended it.[24] Clearly, we have a long way to go. In an age of agricultural production sufficient to supply the food needs of all humanity, millions starve or are malnourished. Food security is elusive. Prime farmland is lost to erosion and urban sprawl. The problems are complex, entangled in political, economic, social, and moral sins. Certainly biotechnology is not the savior that some make it out to be, yet we ignore it at our peril. Within a place-based paradigm that upholds local cultures and ecosystems, I believe that it can be an appropriate tool for shalom. But using this tool will require us to act in a Christ-like manner, submitting ourselves to serve the creation and our most vulnerable brothers and sisters by giving up the illusions of control over the means of food production.

## Lessons from the Green Revolution

The Green Revolution of the 1960s and '70s saw the development of high-yielding dwarf varieties of wheat, rice, and other grains by crop breeders in the public sector. It enabled

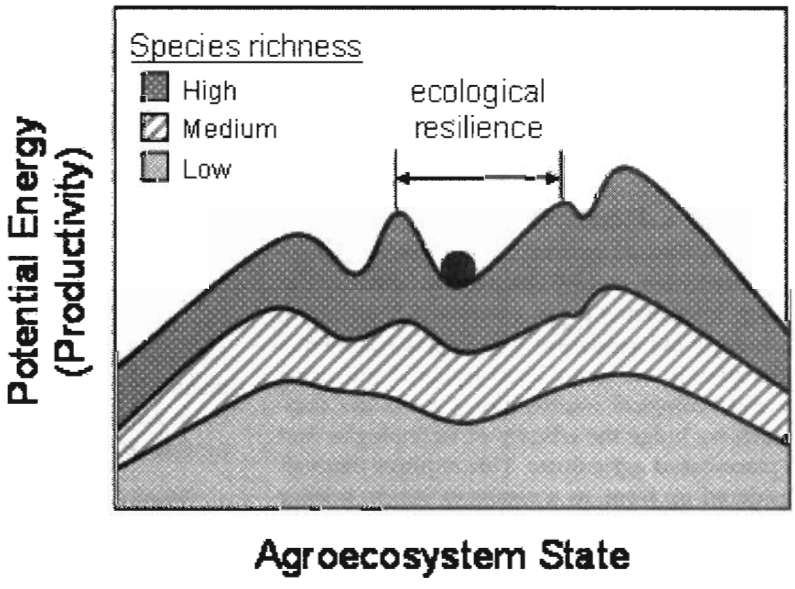


**Figure 1.** Basic concept of ecological resilience as it applies to agroecosystems. Agroecosystems can exist in different states of productivity and resilience. Like natural ecosystems, they are stable within certain thresholds (peaks in the curves), a function of species richness (i.e., number of functional groups), mutually reinforcing structures and processes (i.e., functional redundancy), and spatial-temporal (i.e., scale) effects. Ecological resilience corresponds to the width of the troughs in these curves. Although these troughs depict potential states of similar productivity, the current state (ball) is most resilient. Note that overall productivity increases with increasing interconnections (upper curve).[30]

countries to produce more than enough grain to feed their own people. India's case is probably the most renowned, moving from devastating famines one after another in the mid-1940s and '50s to becoming a net exporter of wheat and rice in the 1970s.[25] Equally important were the agricultural reforms and infrastructure investments that coincided with the adoption of the new grain varieties. Nevertheless, the Green Revolution was a mixed success. The resulting intensification of production required more water and chemical fertilizers. Soil fertility suffered. The new type of farming required more capital. Those who could not afford it were forced to migrate to the burgeoning slums in India's cities, where many unskilled workers languished. While India's government grew rich on grain exports with some stockpiles even rotting in the ports, millions continued to go hungry.

While the successes of the Green Revolution demonstrate the positive role genetic technologies can play in improving crop productivity, its failures underscore the importance of place. Research conducted in one place on very productive land cannot automatically be translated to another place without incurring some unintended and unforeseen consequences. Gordon Conway of the Rockefeller Foundation acknowledges that for agricultural research to be applicable under highly diverse conditions it must be conducted under those conditions in those places.[26] He advocates a "doubly green revolution" that is place-based, "starting with the socio-economic demands of poor households [before] seeking to identify the appropriate research priorities" and making "greater use of indigenous resources."[27]

## Place as a Normative System

Moral philosophies and ethical traditions have an enormous impact on the development and adaptation of agricultural policies and technologies.[28] To determine what is appropriate for agriculture, I am advocating a greater emphasis on place as a normative system. This practical, more complex system is based on biocentric and theocentric values identified by Spaling and Wood.[29] While not ignoring utility, it downplays the prevailing econocentric utilitarian approach in agriculture for the reasons outlined above. But what does it mean to consider place as normative? Imagine a particular agricultural place. What are the normal characteristics of that place? What are the human relationships to it? How would you devise technologies to fit it? Your answers to these questions would begin to define what I mean by a place as a normative system. In place-based agriculture, we chiefly are concerned about the cultural and ecological characteristics of a particular bioregion—or foodshed. Our goal is to develop technologies that are appropriate, that match the needs and cycles of that place in a way that is resilient— that is, promoting ecological and cultural sustainability. These then are the five earmarks of place-based agriculture as a normative system:

1. *Place-based agriculture is attuned to the ecological resilience of local bioregions.* To develop and implement appropriate technologies, it first seeks to understand local ecological resilience. Especially important are the mutually reinforcing structures and processes that keep agroecosystems within certain stable states (Figure 1).[30] Species richness enhances resilience by enhancing functional redundancy: loss of one species can be compensated by another with the same function. Monocultures, thus, have lower resilience. Reinforcing structures and processes are also dependent on scale: organisms interact more with others their size; fast processes may cumulatively affect slow processes.

2. *Place-based agriculture is responsive to the needs and knowledge of local communities.* It operates under the assumption that locals, through their experience in a place, have learned about its needs and nuances. This does not remove the need for experts because often we fail to see what is right in front of us. Rather, the experts work with the locals to see and to understand what is needed. "Local knowledge and the practical become intertwined with the cosmological, how one sees the world."[31]

3. *Place-based agriculture is sensitive to community values.* While values in a pluralistic society may be contentious, "an approach that explicitly recognizes differing land ethics may suggest policy options that might lessen conflict and bring a satisfactory, long- term resolution."[32] The communal nature of this is key. "The moral economy of the foodshed will not be based on individuals with unrestrained freedom to pursue their own self-interest, but will be shaped and expressed in communities that attempt to build sustainable relationships amongst themselves and with the land. Wise ethical systems are, in their living out, place-based."[33] In this way, policies in place-based agriculture work to enhance local cultural resilience, not global efficiency.[34]

4. *Place-based agriculture exercises precaution, care, and restraint.* Those who exercise precaution think before they act. In this is great wisdom. Current agricultural policies require safety and efficacy tests prior to marketing of new products. But questions remain: How much testing is enough, under what conditions, and for what contingencies? To resolve these issues requires greater attentiveness to place and contextual moral deliberation amongst stakeholders.[35] We also would do well as a society to reconsider our addiction to individualism and consumerism, which erode our sense of community, caring, and restraint. We must regain the joy of Sabbaths.[36]

5. *Place-based agriculture solutions enhance embeddedness in local ecosystems and cultures.* Founded on a perichoretic understanding of humans in the natural world, place-based agriculture develops technologies and practices attentive to the paces and scales of local ecosystems as models.[37] Therefore, husbandry, contextual research, and community well-being take priority over mechanization, purely reductionistic research, and individual liberty.[38]

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Models for place-based agriculture exist. A sampling of these includes the following:

- The Educational Concerns for Hunger Organization (ECHO).[39] ECHO's focus is on alleviating hunger in the tropics by working with native peoples in their places to develop new agricultural crops and products. They maintain a seed bank at their Florida campus. They also fund a number of small grants to explore specific novel technologies, supporting the integration of farm-based and science-based technologies.
- Natural Systems Agriculture at the Land Institute.[40] The Land Institute advocates a paradigm for food production where nature is mimicked rather than subdued and ignored. They have already demonstrated the amazingly high productivity of native mixed prairies, and are now trying to perennialize key annual crops in developing farming practices that mimic a native prairie system. The Matfield Green Consortium works to translate the work and philosophy of the Land Institute into meaningful place-based educational materials for K–12 schools.
- Community Supported Agriculture (CSA) and local food policy councils.[41] CSAs draw local consumers into partnerships with local farmers who are receptive to their values. Most are organic. Local food policy councils and CSAs strive to develop regional food supplies and strong local economies, to maintain a sense of community (place), to encourage land stewardship, and to honor the local knowledge of producers on small to medium farms. While both provide a means for place-based communal contracts between growers and consumers, they still face significant challenges.

## Do GM Crops Belong in Place-Based Agroecosystems?

Unfortunately, current GM crops do not conform to the place-based norms outlined above. While herbicide tolerant crops do facilitate soil conservation through no-till agriculture, they still rely heavily on chemical inputs to prop up intensive monocultures. Weeds, defined as plants growing in the "wrong place," will always exist. But they become a serious problem when agricultural practices open up niches best suited for r-selected species (those that reproduce quickly and/or are invasive). By putting more effort into research on polycultures, we may identify more appropriate and sustainable solutions to weed control. Particularly troubling are non-indigenous invasive species. Exacerbated by global trade, these require a type of research and management vigilance similar to that which the Centers for Disease Control practice for emerging human diseases. Biotechnologists and ecologists must collaborate together in addressing this problem. Similarly, I am not convinced that Bt crops and animal vaccines are the best solution for controlling pests. Pest populations thrive in large, persistent monocultures. Relying exclusively on biotechnologies will only speed the evolution of pest resistance, much like the current crisis of antibiotic resistance in microbial pathogens. Polycultures, crop rotations, and trophically based pest management must be integral to solutions.[42]

Regarding the place of biotechnology within place-based agriculture, I advocate "critical engagement." This is borne out of my Christian faith, which places the doctrines of the Creation, Fall, Redemption, and Restoration at the foundations of an all-encompassing world view that guides a sense of vocation.[43] I contend that tenets based on these widely-held doctrines contribute rationales for both promoting and restraining biotechnology (Table 2). No doubt this is one reason why Christian organizations struggle to formulate appropriate responses to concerns and issues raised by biotechnology. Nevertheless, I see this tension as healthy. It provides a context for both criticism and engagement—hence critical engagement. It bids us to think and care before we act. It compels precaution even as we consider how biotechnology might enhance our care of creation.

Precaution as a guiding principle, spawned by the environmental movement of the 1970s, has gradually become more formalized since the advent of GM foods.[49] In recent years, a Precautionary Principle has evolved through a series of articulations and clarifications. One rendition, known as the Wingspread Statement, was formulated via consensus by a diverse group of scientists,

law makers, politicians, philosophers, and environmental activists. It defines the Precautionary Principle succinctly:

> When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically.[50]

Moreover, the Wingspread Statement contains three important caveats. First, precaution shifts the burden of proof from the public (or opponents, more specifically) to proponents. Second, it necessitates an open and democratic decision-making process where stakeholders' views are represented. Third, precaution requires consideration of the full range of options, including no action before proceeding.

When integrated with our Christian faith tenets and their implications for agbiotech (Table 2), I find these caveats very fruitful. For example, if we understand that God has entered into covenantal relationships with all living creatures (e.g., Gen. 9:8–17), then it follows that we should not take lightly the genetic alteration of those creatures or the physical alteration of their environments. Precaution in the face of alterations that may affect the intrinsic relational nature of organisms seems particularly appropriate. Moreover, the caveats are consistent with the Christian assertion that faith must inform all of our actions, including those involving science and technology. In this world view, faith is a prerequisite to social and moral responsibility.

However, overtly putting values first in matters of science and technology seems to be a radical notion in our society—suspected because it introduces personal biases into the decision-making process. Instead, "scientific agencies ... are required by law to develop regulations based on sound science," which is assumed to be value-neutral.[51] Critics' views are not considered unless couched in scientific terms. The result is political disenfranchisement, dissonance, and/or gridlock. Applying the Precautionary Principle could provide an essential corrective. Nancy Myers explains it this way:

> The principle makes it clear that decisions and developments in science and technology are based first of all on values and only secondarily on scientific and technological fact and process. Moreover, a precau-

**Table 2. Tenets of the Christian Faith Inform Our View of Agbiotech**

| Doctrines and Their Tenets | Implications for Agbiotech |
|---|---|
| ***Doctrine of Creation*** | |
| Tenets that promote agbiotech<br>• Humans are called to serve as God's viceroys (Gen. 1:28) and protector-servants (Gen. 2:15) of God's creation.<br>• God allows us to use some plants and animals to meet needs (Gen. 9:3). | Agbiotech may be an appropriate tool for creation care "with compassion and mercy, like to that of God Himself."[44] |
| Tenets that restrain agbiotech<br>• Our world belongs to God (Ps. 24:1).<br>• God calls creation "very good" (Gen. 1:31).<br>• Creatures have intrinsic value (Gen. 1:22).<br>• Creation is an ongoing Trinitarian activity (Ps. 104). | When interacting with other creatures, we must consider that God has a covenantal relationship with them. God loves all creatures and delights in wildness (Job 39). |
| ***Doctrine of the Fall*** | |
| Tenets that promote agbiotech<br>• Technology and public policy can be used to deter human sin/abuses (Rom. 13:1–3). | Agbiotech may be appropriate within certain contexts, especially as a means of alleviating sin's effects. |
| Tenets that restrain agbiotech<br>• Technologies are often used or thwarted for evil purposes (Ps. 35:12).<br>• God judges us on the basis of our land stewardship (Lev. 26:33–35).<br>• Places bear the consequences of human apostasy (Hos. 4:1–3). | We must bear in mind the noetic effects of sin in our work, combating it via "communal, multiperspectival effort."[45] |
| ***Doctrine of Redemption and Restoration*** | |
| Tenets that promote agbiotech<br>• Redemption is cosmic, not just personal (John 3:16).<br>• Seeking justice, loving mercy, and walking humbly with God (Micah 6:8) are measures of our ministry of reconciliation (2 Cor. 5:18). | Technology's purpose is to sustain, restore, and improve.[46] "The place God calls you to is the place where your deep gladness and the world's deep hunger meet."[47] |
| Tenets that restrain agbiotech<br>• We rely on God's grace, not solely on our own power, to sustain us (Eph. 2:8). We must learn to cultivate contentment (1 Tim. 6:6).<br>• We are accountable to God who "opposes the proud, but gives grace to the humble" (James 4:6). | Agbiotech and its policies must conform to God's restoration plan. "Humans are accountable to the Creator for their relationship with the land."[48] |

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> tionary approach is best carried out in the context of goals that embody values of communities and societies.[52]

Instead of decisions made exclusively by agbiotech practitioners, the Precautionary Principle advocates goal-setting involving the widest possible array of stakeholders: farmers, rural community leaders and governments, consumer groups, environmental groups, faith-based groups, and so forth.

Instead of one-size-fits-all solutions intended for global distribution, the Precautionary Principle advocates solutions that are appropriate to a particular place.

Instead of letting market forces drive technology development (assuming new technology that sells is inherently better, unless critics can produce compelling evidence to the contrary), the Precautionary Principle compels proponents to prove the worth of a technology before proceeding with its application.

In essence, the shared goals and values that emerge from open dialogue, necessitated by the Precautionary Principle, set the context for scientific and social assessment. They provide a framework for doing science in a manner consistent with the values of our Christian faith. As Dieter Hessel puts it:

> Attention to eco-socially appropriate technology does not rule out [biotechnology]; it asks for deeper ethical reflection, alert to intuitive religious sensibilities about what is good and right, and for more democratic social involvement to limit or channel this qualitatively different human activity for the good of all.[53]

But what are we to make of biotechnology practitioners' opposition to the Precautionary Principle? They are justifiably worried that a strong version of the Precautionary Principle could escalate costs of implementing this, or any other new technologies with unpredictable consequences, to prohibitive levels. Henk van den Belt makes a good case that this is untenable. A strong version "commits us to each of two contradictory policies: (a) We must not develop GM crops, and (b) We must develop GM crops."[54] While the first is readily apparent, the second option could be true if GM technology is later deemed absolutely necessary to prevent environmental degradation and to meet the food needs of a burgeoning population. Is there a middle position, namely that a weaker version of the Precautionary Principle may be appropriate? Van den Belt seems to hint of receptiveness to this when he characterizes the positions of those who hold to the Precautionary Principle and of those who hold to sound science as "unduly polarized." A weaker version, applied on a case-by-case basis, seems consistent with my arguments above.[55] It would balance place-attentive risk assessment with a collectively brokered objective.

*Ecological principles, inherently focused on interrelationships, must have a greater role in governing our priorities if agbiotech is to be useful for enhancing agroecosystem integrity and resilience ...*

## Enhancing Cultural and Agroecosystem Resilience

Those involved in agbiotech can contribute to restoring the myriad of relationships marred by sin, including genetic interactions between organisms that may have been compromised (e.g., via gene silencing) through millennia of human intervention in polycultural landscapes as we intensified monocultural systems. Ecological principles, inherently focused on interrelationships, must have a greater role in governing our priorities if agbiotech is to be useful for enhancing agroecosystem integrity and resilience (properties that cannot be deciphered through purely reductionistic research). The term agroecosystem, "an ecological and socio-economic system, comprising domesticated plants and/or animals and the people who husband them, intended for the purpose of producing food, fibre or other agricultural products,"[56] conveys the complexity and richness of this new paradigm. Agroecology is widely embraced as key to sustainability (often a politically contentious concept). It is helpful to link these two terms together. "Agricultural sustainability," explains Gordon Conway, "is the ability of an agroecosystem to maintain productivity in the face of stress or shock."[57]

This is analogous to ecologists' current understanding of ecological resilience and succession. In contrast to earlier models of a linear progression of events from simple organisms to balanced interconnecting life systems, we now recognize ecosystems as complex, dynamic, irreversibly evolving systems with humans as a keystone species.[58] Ecosystems are not balanced, nor are they in equilibrium. Indeed, ecosystems can

be shocked or stressed into an altered state if certain thresholds are exceeded (Figure 1). Regrettably, this often occurs through human activity even before those thresholds are known.

*We must resist the urge to modify "just because we can" ... we first need to acknowledge our dependence on God ... Then, we need to cast ourselves playfully in the role of God ...*

Deciding what is appropriate for place-based agroecosystems is no small task. It will take collaborative effort among growers, scientists, policy-makers, community leaders, consumers, and other stakeholders attuned to place to reach consensus. We need policies, management practices, and ecologically appropriate buffers to protect the agroecosystems of one region from those of neighboring regions. We will need to honor the decisions of communities on whether to adopt GM crops, and if so, which ones. The work ahead will be long and difficult, but I think it is essential for developing a truly sustainable agriculture. First, this requires a more thorough, integrative research of the interconnecting systems that affect ecosystem resilience. Biotechnology and the emerging field of systems biology can contribute a wider assessment of genetic diversity and a more detailed account of the interplay between environmental stress and gene expression. Second, these findings must be coupled to democratic approaches to problem-solving, where stakeholders' interests, especially those often disenfranchised in our current system, are represented fairly. Third, care theory, which emphasizes the relational nature of humans and the importance of community integrity,[59] also should inform our decision-making in agbiotech as it reflects values critical to the sustainability of agroecosystems. With its overemphasis on individual liberty and consumerism, our current system often runs roughshod over the best interests of our communities, especially in rural areas where this has already reached crisis proportions.[60] Care and restraint are essential.

Exemplary biotechnologies that may be considered for place-based agriculture include the following:

- *Microbial biotechnologies to aid nutrient cycling.* In traditional rural ecosystems, soil fertility was maintained with some degree of success by incorporating animal manures and crop residues into the soil each year. Now most foods are trucked to large cities. This represents a significant challenge for any farming system. Somehow nutrients from large municipal wastes must find their way back to the farms so that soil fertility can be sustained without adversely affecting natural ecosystems. Microbial biotechnologies may offer some innovative solutions to capture those nutrients in a bioavailability form that is economically sustainable and socially inoffensive. This would also alleviate significant pollution problems.
- *Enhancing resilience within polycultures and intercropping systems.* Crops are subject to weather extremes, invasive species, emerging diseases, which substantially alter productivity. While polycultures and intercropping systems have higher resilience than monocultures, there is much we need to learn about the mechanisms of resilience at all levels of biological organization (from ecosystems to cells and genes). Genomic/proteomic and systems biology approaches can provide important insights when coupled with ecological understanding. Biotechnology may yield profoundly positive effects in restoring genes essential to resilient interactions in polycultures, genes whose expression may have been silenced through millennia of monoculturization.
- *Animal biotechnologies that help to reduce environmental impacts of livestock.* In conjunction with ecologically sound management practices, biotechnology can help to reduce the exchange of pathogens and parasites between livestock and wildlife populations. Likewise, it may be useful in restoring traits that facilitate livestock interconnections with rangeland environments—traits compromised by domestication and more recent intensification. In conjunction with less concentrated forms of animal production, it may help reduce nitrogen and phosphorous levels in manure, thereby posing less risk to aquatic systems.
- *"Green" food/fiber processing technologies.* Food and fiber processing currently contributes substantially to water/resource demand and to pollution. Biotechnologies that complement ecological sustainable practices may help to reduce these problems.

We must resist the urge to modify "just because we can"—approaching our work with greater humility instead. We need to rediscover what it means to play God in the correct way.[61] That is, we first need to acknowledge our dependence on God; our responsibilities, though great, are not of messianic proportion. Then, we need to cast ourselves playfully in the role of God, like an actor playing the part of a historical figure who first studies the life and times of that person. This is an opportunity for us to reflect about who God is as creator, healer, and advocate over all creation. It invites us to exercise those same attributes "in response to God, in imitation of God's ways, and in service to God's cause ... to promote life and its flourishing."[62] ✦

# Article

*Place-Based Agriculture: Christian Environmentalism Informing Collaborations in Agroecology & Biotechnology*


## Acknowledgment

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## Notes

[1]A. L. Peterson, *Being Human: Ethics, Environment, and Our Place in the World* (Berkeley, CA: University of California Press, 2001), 21, 48–9; and D. R. Williams and S. I. Steward, "Sense of Place: An Elusive Concept That Is Finding a Home in Ecosystem Management," *Journal of Forestry* 92 (1998): 18–23.

[2]W. Jackson, *Becoming Native to this Place* (New York: Counterpoint Press, 1996); and W. Berry, *The Unsettling of America: Culture and Agriculture* (San Francisco: Sierra Club Books, 1977).

[3]According to the USDA (www.ams.usda.gov/nop/NOPPresentation/home.html) and Agriculture & Agri-Food Canada (http://atn-riae.agr.ca/supply/3313_e.htm), the organic food segment is currently growing at 20% annually.

[4]This is most obvious in the debates over food labeling. Lobbyists representing agbiotech and industrial agriculture interests in North America argue that country of origin does not affect foods materially, nor does the method of production (GM vs. conventional). Hence, foods do not need to be labeled in this way. However, in response to consumer demand the U.S. Dept of Agriculture has instituted a labeling system for foods produced organically.

[5]Studies of Minnesota grassland communities grown under various levels of $CO_2$ and nitrogen have demonstrated that biomass production is a function of both species richness and functional group richness (P. B. Reich, D. Tilman, S. Naeem, D. S. Ellsworth, J. Knops, J. Craine, D. Wedin, and J. Trost, "Species and Functional Group Diversity Independently Influence Biomass Accumulation and Its Response to $CO_2$ and N," *Proceedings of the National Academy of Science* USA 101 [2004]: 10101–6). These researchers have also shown that experimental reductions in plant species richness increases this ecosystem's vulnerability to invasive species, pathogens, and insects (J. M. H. Knops, D. Tilman, N. M. Haddad, S. Naeem, C. E. Mitchell, J. Haarstad, M. E. Ritchie, K. M. Howe, P. B. Reich, E. Siemann, and J. Groth, "Effects of plant species richness on invasion dynamics, disease outbreaks, insect abundances and diversity," *Ecology Letters* 2 [1999]: 286–93).

[6]Plant geneticists are working to improve crop tolerance to a plethora of environmental stresses nuanced to specific places. Aluminum toxicity, for example, is a serious problem in tropical acidic soils. High aluminum levels reduce the uptake of phosphorous by plants. Researchers have discovered that plants whose roots secrete citrate are better able to take up phosphate from such soils (J. M. de la Fuente, V. Ramirez-Rodriguez, J. L. Cabrera-Ponce, L. Herrera-Estrella, "Aluminum Tolerance in Transgenic Plants by Alteration of Citrate Synthesis," *Science* 276 [1997]: 1566–8).

[7]E. A. Bray, J. Bailey-Serres, and E. Weretilnyk, "Responses to Abiotic Stress," in B. Buchanan, W. Gruissem, and R. Jones, eds., *Biochemistry and Molecular Biology of Plants* (Rockville, MD: American Society of Plant Biologists, 2000), 1159.

[8]P. A. Matson, W. J. Parton, A. G. Power, and M. J. Swift, "Agricultural Intensification and Ecosystem Properties," *Science* 277 (1997): 504–9.

[9]J. M. Curry, "Care Theory and 'Caring' Systems of Agriculture," *Agriculture and Human Values* 19 (2002): 119–31.

[10]J. M. Curry and S. McGuire, *Community on Land: Community, Ecology, and the Public Interest* (Lanham, MD: Rowman & Littlefield, 2002), 133–8.

[11]W. Heffernan, "Consolidation in the Food and Agriculture System," Report to the National Farmers Union (1999); and P. Howard, "Consolidation in Food and Agriculture: Implications for Farmers and Consumers," *CCOF Magazine* (Winter 2003–2004): 2–6. Dozens of similar reports are available at the Agribusiness Accountability Initiative's website: www.agribusinessaccountability.org.

[12]A. Sagar, A. Daemmrich, and M. Ashiya, "The Tragedy of the Commoners: Biotechnology and Its Publics," *Nature Biotechnology* 18 (2000): 2–4.

[13]S. Sundlof, "The Role of Science in Regulation and Decision Making," *AgBioForum* 3 (2000): 137.

[14]Sampling regional cuisines (products of unique agroecosystems) is one way North Americans celebrate cultural diversity. Cultural traditions, holidays, festivals, and family gatherings invariably involve specific foods linked to the meaning of these events and serving to rehearse our collective cultural memory. Would Thanksgiving continue to hold its cultural identity without the distinctively New England turkey and cranberries? Foods have deep religious meaning, too. Most would consider it sacrilegious to substitute pizza and Coke for bread and wine at the Lord's Supper. Foods are also deeply personal. Our daily patterns of eating different foods for breakfast, lunch, and dinner provides a rhythm to our lives. In light of this, are not concerns about GM foods understandable?

[15]Industrial agriculture and agrarian agriculture represent ends on a continuum of current practices. For an analysis, I recommend D. Atkinson, "Agriculture – Reconciling Ancient Tensions," *Ethics in Science and Environmental Politics* 2002: 52–8. Subsistence agriculture also contributes enormously to food production, especially in the southern hemisphere. Although it shares some characteristics with North American agrarian agriculture, they are not equivalent – but that is another topic.

[16]G. D. Stone, "Both Sides Now: Fallacies in the Genetic-Modification Wars, Implications for Developing Countries, and Anthropological Perspectives," *Current Anthropology* 43 (2002): 611–30.

[17]Theologian Colin Gunton in *The One, the Three and the Many: God, Creation and the Culture of Modernity* (Cambridge: Cambridge University Press, 1993) uses the term perichoresis – "a dynamic reciprocity, interpenetration and interanimation" (p. 163) – to describe interrelationships within the Trinity, between God and creation, and between all elements of being in creation. In a perichoretic world "everything ... contributes to the being of everything else, enabling everything to be what it distinctively is ... a dynamic order that is summoned into being and directed towards its perfection by the free creativity of Father, Son and Holy Spirit" (p. 166). It follows, then, that "the character of our relation with the natural world will be at the centre of human concern ... [and] at least as great a threat is made by the fragmentation of human culture" (p. 173).

[18]Curry and McGuire point out the connections between Enlightenment individualism and conventional practices and policies in U.S. industrial agriculture. Since scientists trained in the dominant means-end reductionistic research paradigm aim to produce general universal knowledge, they ignore the interrelationships unique to place – as do policy makers. Ironically, when profit maximization takes priority over land stewardship and community interests, individual farmers and rural communities lose economic and political clout to transnational corporations. See Curry and McGuire, *Community on Land*, 133–8.

[19]N. Myers, "The Precautionary Principle Puts Values First," *Bulletin of Science, Technology, & Society* 22 (2002): 210–9.

[20]To argue that something produced through human input is essentially unnatural is to follow an exceptionalist view that humans are somehow set apart from nature. A scriptural view of humanity from the stories of Noah and Job sees "the human decentered and properly placed among the myriad of God's creatures" (S. Bouma-Prediger, *For the Beauty of the Earth: A Christian Vision for Creation Care* [Grand Rapids, MI: Baker Academic, 2001], 104).

Consider also the flip side in W. Cronon, *Uncommon Ground: Toward Reinventing Nature* (New York: W. W. Norton, 1995):

> The work of literary scholars, anthropologists, cultural historians, and critical theorists over the past several decades has yielded abundant evidence that "nature" is not nearly so natural as it seems. Instead, it is a profoundly human construction. This is not to say that the nonhuman world is somehow unreal or a mere figment of our imaginations – far from it. But the way we describe and understand that world is so entangled with our own values and assumptions that the two can never be fully separated. What we mean when we use the word "nature" says as much about ourselves as about the things we label with that word (p. 25).

[21]Z. Hanley, and K. Elborough, "Re-emerging Biotechnologies: Rehabilitating the Terminator," *ISB News Report* (June 2002): 3–5.

[22]D. T. Hessel, "Now That Animals Can Be Genetically Engineered: Biotechnology in Theological-Ethical Perspective," in R. S. Gottlieb, ed. *This Sacred Earth: Theology, Nature, Environment* (New York: Routledge, 1995), 629.

[23]Curry and McGuire, *Community on Land*, 202.

[24]With insights from theologian Allen Verhey regarding our calling to imitate God, ethicist James Peterson concludes in his book, *Genetic Turning Points: The Ethics of Human Genetic Intervention* (Grand Rapids, MI: Eerdmans, 2001): "Redemption restores our pre-fall opportunity to grow toward God and into what we should be. The good creation is the starting point, not the finale we seek to regain" (p. 86).

[25]Anonymous, *Pursuit and Promotion of Science: The Indian Experience* (New Delhi, India: INSA, 2001).

[26]G. Conway, *The Doubly Green Revolution: Food for All in the Twenty-First Century* (Ithaca, NY: Cornell University Press, 1997), 41.

[27]Ibid., 42.

[28]H. Spaling and J.R. Wood, "Greed, Need or Creed? Farmland Ethics in the Rural-Urban Fringe," *Land Use Policy* 15 (1998): 105–18.

[29]Ibid., 106–8.

[30]Figure 1 is based on the concept of ecological resilience as presented in G. Peterson, C. R. Allen, and C. S. Holling, "Ecological Resilience, Biodiversity, and Scale," *Ecosystems* 1 (1998): 6–18. For more detailed analyses of the concept of ecosystem resilience, I recommend these articles: C. S. Holling "Understanding the Complexity of Economic, Ecological, and Social Systems," *Ecosystems* 4 (2001): 390–405; and M. Sheffer, S. Carpenter, J. A. Foley, C. Folke, and B. Walker, "Catastrophic Shifts in Ecosystems," *Nature* 413 (2001): 591–6.

[31]Curry and McGuire, *Community on Land*, 201.

[32]Spaling and Wood, "Greed, Need or Creed?" 115.

[33]Curry and McGuire, *Community on Land*, 202.

[34]Note however, that in North America we have typically uprooted our value systems from the land. This mistake must be rectified so that our values may be relevant in our pluralistic society. Christian groups should take the lead in grounding their faith in the type of creation care ethics envisioned in this *PSCF* issue.

[35]Curry, "Care Theory and 'Caring' Systems of Agriculture," 124–5.

[36]When considering the Sabbath principle as it applies to agriculture, the poetry and prose of Wendell Berry are particularly inspiring. For a biblically based assessment that echoes Berry's sentiments, I highly recommend this recent piece: S. P. Carruthers, "Farming in Crisis and the Voice of Silence – A Response to David Atkinson," *Ethics in Science and Environmental Politics* 2002: 59–64.

[37]W. Jackson, *Altars of Unhewn Stone: Science and the Earth* (New York: North Point Press, 1987).

[38]Curry, "Care Theory and 'Caring' Systems of Agriculture," 119–31.

[39]www.echonet.org

[40]www.landinstitute.org

[41]Local food economies support tremendous benefits to communities and their environments. For a very insightful analysis, I recommend B. Halweil, "Home Grown: The Case for Local Food in a Global Market," Worldwatch Institute paper #163 (2002).

[42]P. A. Matson, W. J. Parton, A. G. Power, and M. J. Swift, "Agricultural Intensification and Ecosystem Properties," *Science* 277 (1997): 508.

[43]C. Plantinga, Jr., *Engaging God's World: A Reformed Vision of Faith, Learning, and Living* (Grand Rapids, MI: Eerdmans, 2002); and A. M. Wolters, *Creation Regained: Biblical Basics for a Reformational Worldview* (Grand Rapids, MI: Eerdmans, 1985).

[44]Carruthers, "Farming in Crisis and the Voice of Silence," 60.

[45]S. K. Moroney, "How Sin Affects Scholarship: A New Model," *Christian Scholars Review* 28 (1999): 432–51.

[46]Peterson, *Genetic Turning Points*, 64–90.

[47]F. Buechner, *Wishful Thinking: A Seeker's ABC* (San Francisco: HarperSanFrancisco, 1993), 119.

[48]Spaling and Wood, "Greed, Need or Creed?" 115.

[49]The philosophical roots of the Precautionary Principle may be traced to the writings of German philosopher Hans Jonas who proposed a rule for decision making in the face of scientific uncertainty, especially when the matters in question have "apocalyptic potential." Whether agbiotech has such apocalyptic potential is a key issue in the GM food controversy. Supported by most environmental groups, it is hotly contested by many agbiotech leaders. Nevertheless, the European Union and other countries have endorsed the Precautionary Principle as a guiding principle, using it to call a moratorium on the sale of GM foods until more is known about potential safety risks. Moreover, it is affirmed in the Cartegena Protocol on Biosafety, now ratified by 54 nations. Since this protocol took effect on 11 September 2003, nations are now legally bound to protect against the risks of transfer, handling, and use of "living modified organisms." Perceiving these as threats to U.S. economic interests, the Clinton and Bush administrations took action against these developments with the World Trade Organization. Indeed, Greenpeace invokes the Precautionary Principle in advocating a ban on the trade of GM products. Their list of criteria that must be satisfied before they would consider accepting GM foods necessitates long term experiments on GM plants. However, they also oppose large-scale field releases essential to meet those criteria. Little wonder why the actions of Greenpeace outrage agricultural biotechnologists. Unfortunately, this also raises their suspicions about the Precautionary Principle.

[50]Although the Wingspread Statement has not been published formally, it is available at the Science & Environmental Health Network's website: www.sehn.org/wing.html.

[51]Sundlof, "The Role of Science in Regulation and Decision Making," 137.

[52]Myers, "The Precautionary Principle Puts Values First," 210.

[53]Hessel, "Now That Animals Can Be Genetically Engineered," 631.

[54]H. van den Belt, "Debating the Precautionary Principle: 'Guilty Until Proven Innocent' or 'Innocent Until Proven Guilty'?" *Plant Physiology* 132 (2003): 1123.

[55]To distinguish this case-by-case approach from the more general Precautionary Principle, some refer to it as a "precautionary approach." Others consider these terms synonymous.

[56]Conway, *The Doubly Green Revolution*, 166.

[57]Ibid., 168.

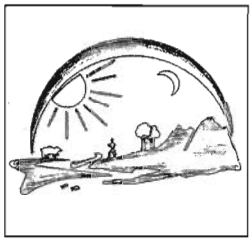
[58]R. V. O'Neill, "Is It Time to Bury the Ecosystem Concept?" *Ecology* 82 (2001): 3275–84.

[59]Curry, "Care Theory and 'Caring' Systems of Agriculture," 119–31.

[60]Agriculturist Jules Pretty argues convincingly that the legacy of modern agriculture is a "dying land" and "dying rural communities" (J. N. Pretty, *The Living Land* [London: Earthscan, 1998]). Peter Carruthers notes: "For some, the crisis in farming is a crisis of existence, and a poignant indicator and symbol of this has been the increased incidence of suicide among farming people" (Carruthers, "Farming in Crisis and the Voice of Silence," 62).

[61]A. Verhey, "Playing God," in J. F. Kilner, R. D. Pentz, and F. E. Young, eds. *Genetic Ethics: Do the Ends Justify the Genes?* (Grand Rapids, MI: Eerdmans, 1997), 66.

[62]Ibid., 69.

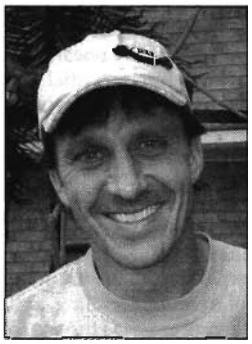


**Article**

*The Good of a Flourishing Creation: Seeking God in a Culture of Affluence*

# The Good of a Flourishing Creation: Seeking God in a Culture of Affluence

*David Warners and Larry Borst*



**Dave Warners**

*Historically Christians have had difficulty formulating a widely accepted ethic and praxis regarding material wealth. This confusion has roots in the scriptures themselves, where material wealth is described in terms of both blessing and caution. The consumptive, affluent lifestyles enjoyed by many North American Christians today find strong affirmation in John Schneider's* The Good of Affluence *(2002). Our central response to Schneider's justification of material affluence is that its focus is too limited. By concentrating on the individual and his or her immediate material context, Schneider seems to overlook God's more encompassing desire for all of creation to flourish. We contrast Schneider's perspective with ours using a rubric based on the biblical concept of shalom. The distinctions include: the interpretation of God's primary desire for human beings (flourishing* materially *vs. flourishing* in diverse ways*); the fundamental nature of human beings (as individuals vs. as members of communities); a prescribed human-creation model (ruler* over *creation vs. servant* within *creation); and the character of our fundamental governing system (*unrestrained *capitalism/consumption vs.* limit-bounded *capitalism/sustainability). Neither blindly condemning nor uncritically condoning material affluence, we propose a model for assessing material affluence based on shalomic living. We hold that God's desire for human beings to flourish is subsumed within (but not replaced by) his desire for all of creation to flourish.*

*Material human affluence typically comes at a cost to nonhuman creation.*

For the past several years, I (Dave) have taught a spring course at the Au Sable Institute of Environmental Studies, a Christian Biological Station in northern Michigan. When I teach at Au Sable, I stay at one of the small cabins they have in a little cluster of buildings on the shore of Big Twin Lake. On most days, after returning from field trips for supper, I stay in the classroom with students until dusk, at which time I walk the half-mile or so back to my cabin.

During these walks, I am treated to a host of evening forest sounds, including frog choruses, small mammal rustlings, and a variety of bird songs. Usually one of the birds I hear is the common loon—who makes an eerie, prehistoric sounding wail that is unmistakable. Without going into details of this bird's biology, it is important to note that loons nest on the shores of lakes that are typically found in remote, undisturbed locations. True to this pattern, the loons do not nest on Big Twin Lake by Au Sable, most likely because summer cabins and cottages surround it. Rather, the loons use Big Twin Lake to feed on the fish found in these waters.

A pattern I have noticed each spring is that human activity around the lake increases substantially as Memorial Day approaches. Many of the cottage owners make their pilgrimage to Big Twin Lake for this holiday weekend. The intensification of human activity is mirrored by a disappearance of loons

**Dave Warners** *grew up in Grand Rapids, attended school with Larry Borst, including Calvin College, where he graduated with a major in biology and chemistry in 1985. Dave earned a Masters in Environmental Studies from the University of Wisconsin-Madison and a PhD in Botany from the University of Michigan. Between degrees Dave and his wife Teri lived and worked for the Christian Reformed World Relief Committee in Tanzania from 1990–1992. He has been teaching botany and ecology courses at Calvin College since 1997. Dave's research interests include restoration ecology, plant systematics and implications of intentional creation-care living. Dave enjoys a variety of outdoor activities with Teri and their three children, many of which are enjoyed with the Borst family. Dave can be contacted at dwarners@calvin.edu.*

from the lake during this same period. From Thursday night through Monday night there are no loon calls from the waters of Big Twin Lake. The human presence is too acute for the birds to enjoy comfortable fishing.

I tell this story as illustration that material human affluence typically comes at a cost to nonhuman creation. The structures around Big Twin Lake are second homes for the people who own them. The boats and jet skis that are ever-present during the holiday weekend are luxury items for individuals who enjoy a lifestyle well above that of subsistence living. While this increased material prosperity may be of benefit to human beings, it has a detrimental effect on the welfare of loons.

I know that I need to be careful in assessing this situation. My income, like that of many North Americans, is clearly at a level above that of subsistence living. Furthermore, one of the cabins on this lake that supports human activity is the one in which I stay. Yet the questions that emerge from this illustration require attention. Does God desire material affluence for human beings? Is the achievement of human affluence more important than the welfare of the broader creation? Does material affluence always necessitate a degradation of creation? Is our current governing economic system (modern capitalism) able to protect nonhuman creation as it responds to resource depletion by increased market prices?

John Schneider's *The Good of Affluence: Seeking God in a Culture of Affluence*[1] has helped to bring me face to face with the challenge of affluence and the potential conflicts it raises for Christians today. This paper represents a working out of questions raised by the loon story, and in the end, offers a new perspective from which such questions can be more appropriately engaged.

## Introduction

When living in Tanzania, my wife and I encountered the notion that taking something one needs from a North American is like taking a bucket of water out of a large river: there will always be more water to replace the bucket that was removed. Ethical implications aside, this is a notion that accurately depicts the concept of affluence—"having a generously sufficient and typically increasing supply of material possessions." A related, but more encompassing concept is "to flourish." This word bears the same root and image as the verb, "to flower." According to Webster's dictionary, "to flourish" is "to grow luxuriantly" or "to thrive."[2]

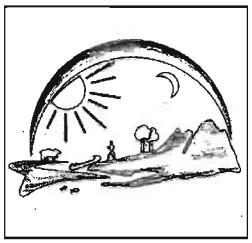
Affluence is a condition with which the church historically has struggled, and yet a condition that many North American Christians enjoy today at unprecedented levels. In this culture, affluence is seen as a precondition for flourishing, and at times the two concepts are treated as the same (consider the image raised by the phrase, "the *good* life"). However, recent studies indicate that in the midst of all this affluence, the actual flourishing of North Americans is remarkably low.[3] While material possessions have become a hallmark of our society, contentment and happiness (i.e., "thriving") have not.

Into this peculiar situation, Schneider articulates a bold and thoughtful justification for lifestyles enjoyed by many North American Christians, lifestyles that too often are simply assumed without the careful thought and assessment they demand.[4] In so doing, he gives the often-neglected business community a theological voice in discussions on resource use and creation care. Schneider raises several legitimate points that environmentalists would benefit from acknowledging. He notes that God desires material affluence for his human subjects; God expects and desires for us to delight in the goodness of his creation; North American capitalism has made valuable contributions to the environmental movement; and, much good can result from material affluence. In sum, we believe a theological perspective on wealth generation, such as Schneider offers, is a perspective that must be engaged when stewardship is considered. Today material affluence comes with too great a cost to the creation and holds too much potential benefit for the creation for it any longer to be left out of discussions on creation care.

*Affluence is a condition with which the church historically has struggled, and yet a condition that many North American Christians enjoy today at unprecedented levels.*

Larry Borst

**Larry Borst** *graduated from Calvin College in 1984 with a major in philosophy. He then graduated from Calvin Seminary in 1989 with a Masters in Theological Studies. He received a teaching certificate from Grand Valley State University in 1990 and has studied World Religion at Western Michigan University. Since 1992, Larry has taught religion at Grand Rapids Christian High School. Larry and his wife, Gretchen, have three children and live next to Calvin's Nature Preserve where he fights the ravages of invader species such as Buckthorn and Garlic Mustard. Larry enjoys reading, camping, hiking, building wooden kayaks and talking with his still close friend Dave about the world, issues of the day, and life in general. Larry can be contacted at lborst@grcs.org.*



# Article

*The Good of a Flourishing Creation: Seeking God in a Culture of Affluence*

*God's desire for human beings to flourish occurs within his desire for the whole creation to flourish. ... There is now little doubt that the current impact of human beings is seriously jeopardizing the ability of the broader creation to flourish.*

Yet, while we find Schneider's contribution valuable, we think the context within which Christians ought to be thinking about material affluence is much larger than he considers. We will proceed by identifying four fundamental starting points on which we find common ground with Schneider; then with each we will offer an expanded interpretation that will bring us to a different endpoint. To conclude, we provide a new, yet simple construct of how affluent Christians can assess their material wealth, and in so doing suggest ways that can bring our wealth into a spiritual and practical framework that is more consistent with our Christian faith.

Although this paper is largely a response to Schneider's book, it parallels the wider tension that has been present for decades between environmentalists and the business/economics community.[5] It is our hope that these efforts will not contribute added divisiveness to this tension, but will instead bring these two groups into closer dialogue.

## Points of Common Ground and Expansion

### *God's Desire for Human Beings*

At the outset of his book, Schneider makes clear that his interpretation of God's desire for human beings is, at its core, one of material blessedness: "... God's primary will is that his human creatures should flourish materially."[6] While we agree that God desires human beings to enjoy life and that a certain level of material affluence is necessary for such enjoyment, we would like to expand Schneider's notion by suggesting this is not God's *primary* goal for us. Words such as "prosper," "prosperity," and "flourish" that appear frequently in Scripture[7] connote more than material flourishing; they refer to a broader notion of flourishing that we defined above. A brief illustration here may help.

When a Tanzanian friend who came to Columbus, Ohio, for graduate work was asked what she thought about living in the United States, she told us she was terribly homesick and wanted very badly to return to Tanzania. Tanzania is one of the poorest countries in Africa, and the place to which she longed to return was Mwanza, a city of one million people with dirt roads in its downtown district, and desperately poor people living in shacks all along its stony hillsides. But this woman would choose Mwanza over Columbus because, as she explained, none of the North Americans she met had any time to get to know her.[8]

For this woman, and countless other global citizens, the flourishing of relationships means more than affluence of finances and possessions. Emphasizing material affluence as God's "primary will" for his human creatures de-emphasizes so many other aspects of our humanity.[9] It is good for us to recognize that while our North American society is rich in material possessions, we can learn much from cultures less blessed with material prosperity, but richer than us in other ways. While we recognize that God is concerned with our affluence, or our *material* flourishing, we do not think this aspect of our personhood is more important than our social or psychological or spiritual flourishing.

Furthermore, God's desire for human beings to flourish occurs within his desire for the whole creation to flourish. His command, "Be fruitful and increase in number," was not only given to human beings but to birds and fish as well (Gen. 1:22). It follows that mere human flourishing is a hollow flourishing; a flourishing that by itself falls short of God's desire for the creation.

There is now little doubt that the current impact of human beings is seriously jeopardizing the ability of the broader creation to flourish. One line of evidence (among many) is that we are currently in the midst of an epic extinction period. Although estimates of the total number of species on earth vary widely from 6 to 30 million (or more), low estimates for extinction rates are in the range of 6 to 10 *per day*.[10] This rate is far in excess of any prior times, including the most recent mass extinction period that occurred at the end of the dinosaur age.[11] While these numbers may be startling enough as they stand, more troubling is the primary cause of extinctions today—habitat loss from the alteration of creation exacted by a single species, *Homo sapiens*. This situation is documented by a host of scientists and also increasingly recognized as a significant problem by economists,[12] business leaders,[13] politicians,[14] philosophers,[15] and theologians,[16] including Joseph Sittler who notes:

> The American epic has come to a turning point in the spirit of our minds. We have, while solving some problems, ignored others. We have fashioned a society and an industrial order at a cost, and the bill is due and payable. The magnificence of our endowment has been cleverly used and appallingly abused. The accumulated garbage of the achievement has befouled the air, polluted the water, scarred the land, besmirched the beautiful, clogged and confused our living space, so managed all human placement and means of movement as to convenience us as consumers and insult us as persons.[17]

Therefore, even beyond limiting the ability of other creatures to flourish, we are the cause of their extermination.[18] In a time such as this, when God's masterpiece of biodiversity is suffering unprecedented degradation, a call for human beings to strive for even greater material prosperity seems tragically (for the broader creation and ourselves)[19] misguided.

## The Fundamental Nature of Human Beings

One of the great comforts and great mysteries of Christianity is that the Creator of all things concerns himself with the welfare of individual creatures such as us. God wants each and every human creature to flourish, and part of that flourishing includes having basic needs met so that we can enjoy and delight in the fruits of creation. On this note, we share common ground with Schneider. However, the concern that our three-in-one, relational God has for individual human beings does not occur in an existential vacuum.[20] He is concerned with us as we exist within a physical and social context, and these contexts are of deep concern to him as well. God's creation is one in which there is no mere existence, only co-existence.[21] We co-exist in relationship with God, with our fellow human creatures and with the broader creation in which we exist, and God is the loving caretaker of all these interconnections.[22]

In *Creating a Just Future,* German theologian Jurgen Moltmann further emphasizes that as community members we are also in relationship with future generations.[23] Moltmann suggests our generation exhibits selfishness with regard to the generations to come. We are exhausting resources, losing precious topsoil, and injecting poisonous chemicals and nuclear wastes into the earth, all at levels that seriously endanger the quality of life for future human beings.[24]

This emphasis on relationality (in space and time) seems largely absent from Schneider's work. His suggested goal for individuals today is one of achieving personal material prosperity, with apparently little regard for the cost it exacts on others. He states:

> It is no doubt why delightful physical actions like getting in good shape, buying a fine new dress or suit, having one's hair done well, shaving and putting on a good aftershave, or getting behind the wheel of a finely tuned car elevate us from various states of depression and discouragement. The same is true of curling up in a pleasurable sitting room in front of a fire in winter, and of grilling steaks on a cedar deck on a warm spring evening ... And it is the condition of affluence alone that makes full delight possible.[25]

While Schneider's images of personal adornment, choice of personal transportation, personal leisure, and food choice may have the ability to make us as individuals experience some degree of "delight," these lifestyle choices may have significant detrimental effects on our relationships with future generations, the earth, our fellow humans today, and on our relationship with the Creator.[26] Recognizing ourselves as relational beings dependent on the integrated communities within which we exist, should have significant consequences for the lifestyle choices we make. God desires "full delight" not only for us as individuals, but also for the communities we necessarily exist within. For many North Americans, leading lifestyles of restraint will likely be more relationship-affirming than leading lifestyles of increasing luxury.[27]

## A Prescribed Human-Creation Model

In the second chapter of *The Good of Affluence,* Schneider comments beautifully on the dangers of consumerism and the power that material affluence can exert over human beings, even those "who sincerely profess faith in the true God."[28] We find strong agreement with these comments, as we do when Schneider goes on to describe God as a loving Creator who finds great joy in the things he has made. However, somewhat peculiarly, Schneider writes that this image of a God who deeply loves and rejoices in his non-human elements of creation is an image we should keep in "the background" as we consider *imago Dei.* If this is who God is, and we are created in his image, we wonder why such a revelation should be kept in the *background.* Instead, we believe this aspect of God's nature is of utmost importance as we think about and live out our relationships within the created world.

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*... in the context of modern consumer capitalism, there is little danger of failing to recognize human dominion. Indeed, the danger seems to be the opposite ...*

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In his ensuing discussion of *imago Dei,* Schneider follows J. Richard Middleton's emphasis on the image of God as connoting God's royal representative, one who holds a kingly dominion over creation.[29] When considering the Babylonian creation account (and the perspective

# Article

*The Good of a Flourishing Creation: Seeking God in a Culture of Affluence*

*If our model for creation care comes from Christ who gave up his life for the entire creation, then instead of viewing creation as a resource for our expanding affluence, we should address the question, what can we give up so that the creation can better flourish?*

of some deep ecologists today who deny any special status for *Homo sapiens*), this emphasis is needed. However, in the context of modern consumer capitalism, there is little danger of failing to recognize human dominion. Indeed, the danger seems to be the opposite, where a notion of royal dominion over creation needs to be balanced by the other voices present in Genesis.

Schneider's treatment of dominion heavily emphasizes the concept of "rule" (*radah*). To *radah* is certainly to *rule*, but to rule in a manner that reflects how the Creator rules. This is where the notion of a God who loves and takes joy in his creation is paramount and should not be relegated to "background" status. A good ruler is one who truly loves and rejoices in the subjects being ruled. A good ruler will insure that the subjects being ruled are allowed to flourish.[30]

God gives additional stewardship directives in Gen. 2:15 where Adam is told to "work" (*abad*) the garden and to "take care of it" (*shamar*). The Hebrew word *abad* is translated elsewhere in the Old Testament as "to serve," as in Josh. 24:15, "But as for me and my household, we will *abad* the Lord." Likewise, *shamar* is rendered with a variety of English translations, including "to keep," "to protect," or "to preserve." The Aaronic blessing common at the conclusion of many worship services from Num. 6:24 uses this same word, "The Lord bless you and *shamar* you." By advocating a utilitarian understanding of *radah* and omitting Gen. 2:15 from his concept of dominion, Schneider develops an image of stewardship that is predominantly nonrelational, controlling and ultimately self-serving.[31]

By contrast, we suggest a broader understanding, infused with the rich meanings of these three Hebrew words, but also based on the model of the incarnate Christ, who took on the very nature of a servant so that all things could be reconciled to God.[32] Stewardship modeled after an embedded, servant Christ will lead to human activity within the creation that foundationally exhibits gentle ruling, serving and preserving.[33] This type of behavior is not consistent with a lifestyle of acquiring ever-increasing material affluence at the cost of creation's integrity. Furthermore, if our model for creation care comes from Christ who gave up his life for the entire creation, then instead of viewing creation as a resource for our expanding affluence, we should address the question, what can *we* give up so that the creation can better flourish?[34]

## The Character of Our Fundamental Governing System

Schneider is clear in his belief that the material prosperity he promotes is best achieved by a capitalistic, technology-based, growth-driven economy. There is little doubt that such a connection has some validity. Quality of life is greatest in capitalist nations, where income levels and health services are high on a global standard. Schneider's point that it is the affluent members of the world that are at the forefront of most environmental movements also deserves consideration (although not blind acceptance).[35] Yet, to simply stop here (as Schneider largely does) is to ignore the costs associated with such an economic system, costs that typically demand significant sacrifice by both the underprivileged of these societies, as well as the natural world in which these societies exist.[36]

We advocate a broader understanding of economy than what Schneider, and many others, typically consider. At its core, "economy" (from the Greek, *oeconomia*) refers to management of the "household." When the household is recognized to be the biosphere,[37] then a proper economy will insure the welfare of the commodities (monetary included, but not explicitly included) of the entire biosphere.[38] In this vein, North American capitalism falls short of what a proper economy should be for at least three reasons: first, it demands an economy that must continue to grow to be successful even though it is dependent on a finite resource base,[39] second, it focuses on human material (financial) welfare, to the exclusion of so many other aspects of humanity (including personal health, peaceful existence, social relationships, etc.),[40] and third, because it only addresses the welfare of one of the members of the household, human beings.[41]

While not dismissing capitalism as the best system for promoting human welfare, we contend that the manifestation of this system in North America is too unilaterally profit (growth) driven and at its core, unsustainable. Schneider writes:

> Eden set the man and woman free from servitude to want, it unleashed them ...

> to take human pleasure in the whole of life ... Capitalism has brought us closer to recreating that condition than has any other economic system in the history of the world.[42]

While there is some legitimacy here, the type of unrestrained capitalism promoted these days is far from Eden-esque. It is good to be reminded that even in Eden there were limits, limits that were part of God's good and perfect creation. The temptation of overstepping good and healthy limits is pervasive in our consumer-based culture. We hold out hope that capitalism can become bounded and re-formed in such a way that good limits are set and respected, and where today's key economic concept of consumption becomes replaced with the more shalomic notion of sustainability.[43]

Several economists provide descriptions of just what such an economy may look like. One of the leading voices is Herman Daly, senior economist in the Environment Department of the World Bank until 1994. Daly advocates a steady-state economy based on ecological principles of limits and sustainability.[44] Among Daly's ideas to promote an environmentally sustainable economy are to stop counting the consumption of natural capital as income, to tax labor and income less while taxing resource depletion more, and to support and develop more local markets, instead of promoting global markets.[45]

Two other current voices that deserve serious consideration are Lester Brown and Bob Goudzwaard. Brown echoes Daly's call for an economy that is ecologically sustainable.[46] He emphasizes that our current economic system erroneously assumes that nature falls under its jurisdiction, but instead, the more appropriate understanding is that any economic system exists within and is limited by its natural context. His emphasis that ecologists and economists work closely together is a development we see as vital to move capitalism into a more sustainable arena. Goudzwaard, a Christian economist from the Netherlands, calls for a conversion of a profit-driven economy to an economy of *care* and an economy of *enough*. He suggests that businesses first use their profit to improve the lives of their workers and the community in which they exist (environmental and social), before using profit to grow the business itself.[47]

Discussions such as this on the relative benefits of various manifestations of an economic governing system run the risk of remaining esoteric, and personally "safe." But we must be reminded that any economic system is made up of individual persons who make daily decisions about their behavior, behavior that will have implications (financial and otherwise) on their surroundings. Therefore, in closing this section, we emphasize that while converting an economic system from the top down is an intimidating prospect, changing personal daily decisions in how we live our lives is something about which we all can be more intentional.

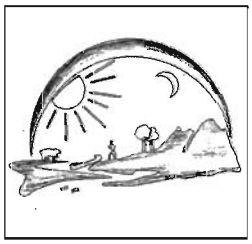
Our encouragement is for individuals to realize that the way we earn or spend or save our financial resources will necessarily have an effect on our relationships within the creation. The lifestyle choices we make on a daily basis are indeed significant, and will speak clearly of our commitment or lack thereof to the welfare of the creation.[48] Carving out a lifestyle in this age of North American material affluence that gives evidence of our devotion to a Creator who deeply loves everything he has made, is a challenging agenda. At times, the implications of our lifestyles for the broader creation are not easily identified; at other times, they are clear but we choose to ignore them. Yet, if our faith truly matters, then it will become manifest in our daily decisions.

For example, we all know that riding a bicycle, walking, car pooling, or using public transportation is better for the creation than driving our individual automobiles. And certain automobiles themselves are less taxing on the environment than others. Supporting local and/or organic farmers is better for the earth than purchasing food grown by industrial agriculture. Being satisfied with one home demands less from the creation than having multiple dwellings. This list can go on and on. What becomes clear in these considerations is that the best choice for the creation is not always the most convenient choice for us, or always the most economically expedient. Yet, if our faith truly matters, then such decisions will transcend convenience and economics, and will lead to lifestyles that bear fruits of blessing for the creation. The significance of these daily decisions is affirmed by Wendell Berry who says:

> How we take our lives from this world, how we work, what work we do, how well we use the materials we use, and what we do with them after we have used them – all these are questions of the highest and gravest religious significance. In answering them, we practice, or do not practice, our religion ...
>
> If ... we believe that we are living souls, God's dust and God's breath, acting our parts among other creatures all made of the same dust and breath as ourselves; and if we understand that we are free, within the obvious limits of mortal human life, to do evil or good to ourselves and to the other creatures – then all our acts have a supreme significance.[49]

## A New Model for Assessing Material Prosperity

For the reasons stated thus far, a new model of assessing our affluence is necessary. Such a model should be embedded in the understanding that we are relational creatures, created by a relational God who allowed his Son to be sacrificed for the reconciliation of everything he created (Col. 1:15–20). Acquisition and enjoyment of affluence, while neither inherently evil nor cosmically good, must be considered in light of its costs to our relationships with other people and our relationships with the broader cre-





*Acquisition and enjoyment of affluence, while neither inherently evil nor cosmically good, must be considered in light of its costs to our relationships with other people and our relationships with the broader creation. Shalom is the guiding principle ...*

ation. Shalom is the guiding principle here—thus affluence should be assessed as proper or improper depending on its ability to promote right relationships that lead to a clearer reality of shalom.

And what is the nature of this coming shalom? Shalom is the condition of God's final kingdom of righteousness and integrity, a condition that began to unfold with Christ's sacrifice, but which will become complete when he returns. That is, we exist in an exciting intermediate time, where we catch glimpses now of the coming glory, but a time in which the coming glory is all too often obscured yet by sin. David Wise notes:

> Kenneth Maahs identifies the future peace of creation ... to imply the fullest manifestation of life as God intends it.
>
> "*Shalom* (peace) is God's dream and promise for the fulfillment of his creation ... the knitting together of all the brokenness in the cosmos, in the relations between man and man, a man and himself, man and nature, within nature, and between man-nature and God."
>
> This image of peace is the peace of the original creation. Much of the prophetic image of the coming creation speaks of peace understood in these terms—all creatures dwelling together without violence.[50]

In contrast to Schneider's notion of human flourishing coming from material delight,[51] the biblical vision of shalom gives us a model of integrity for all of creation, humans and nonhumans together living in a way where the entire creation can flourish— materially, ecologically, socially.[52] God's desire for humans to flourish (materially or otherwise) should not preempt the ability for the broader creation to flourish; instead, in shalom such blessing will be realized by all. This shalomic vision of an integrated, flourishing creation should be at the heart of discussions on proper lifestyles and should be the litmus test by which material affluence is evaluated.

Based upon this vision, our proposed model for assessing material affluence begins with a simple illustration:

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I----------I----------I
Sacrificial  Relational  Cosmic Good
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The Cosmic Good position (Schneider) calls on people to free themselves of guilt and to uncritically enjoy their affluence. The Relational perspective (largely ours) encourages redirection of the fruits of affluence outward from consumption by individuals to benefit the broader community (creation) in which they exist. While this paper is largely a comparison of the Cosmic Good and Relational categories, we also recognize a Sacrificial perspective that calls on affluent persons to feel guilty about their wealth and to give up their affluence for the welfare of others or for the welfare of the earth. Occupying the middle ground between guilt and affirmation, the Relational perspective regrets and works to minimize the cost on creation that humans have exacted, yet also promotes joyful lives that celebrate sustainability as an intrinsic element of shalom.

For assessing material affluence, we suggest three initial questions that arise from the model: (1) Where are we located on the continuum? (2) Would movement on the continuum result in a more shalom-promoting outcome? and (3) In today's world, to what extent should we, as Christians, be expected to relinquish the material goods our affluence makes possible?

Developing honest and informed answers to these three questions is a challenging task. This appraisal is best done in community, where the wisdom of others can balance our self-interests. Again, this underscores the importance of recognizing our personhood as foundationally relational. In a culture that affirms and rewards individualism, the witness of the church, that we are fundamentally dependent upon one another and the whole of creation, is desperately needed. We must evaluate our material affluence with acknowledgment of these interdependencies and then develop lifestyles that promote the welfare of all of creation.

> There is no doubt, in any case, that our way of life will change. The question is whether it will change in an avalanche of evil consequences, or before it, because we have changed our minds, that is, whether necessity will change us or whether, by repenting, we retain some freedom to choose a better way.[53]

## Conclusion

We conclude that a theological perspective on wealth generation needs to be present in discussions on creation care. Schneider's

contributions are valuable in this regard, yet they arise from a limited, human-centered context that we feel should be more expansive. Although some degree of material affluence is part of human flourishing, God desires that we flourish in many ways beyond mere material flourishing. God also desires for his entire creation to flourish, including the relationships that are inherent in the creation. Our current economic system of unrestrained capitalism does more to degrade relationships and the natural world than it does to promote shalom. A more controlled and earth-affirming capitalism is needed. Finally, assessment of our material affluence should recognize the costs and potential benefits of affluence, using Shalom as a guiding principle. ✦

## Acknowledgment

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## Notes

[1]John Schneider, *The Good of Affluence: Seeking God in a Culture of Affluence* (Grand Rapids, MI: Eerdmans, 2002).

[2]*Merriam Webster's Collegiate Dictionary*, 10th ed. (Springfield, MA: Merriam-Webster, Inc.).

[3]Wendell Berry, *Sex, Economy, Freedom and Community* (New York: Pantheon, 1992); Alan Durning, *How Much is Enough? The Consumer Society and the Future of the Earth* (New York: W. W. Norton and Company, 1992); and Paul Wachtel, *The Poverty of Affluence: A Psychological Portrait of the American Way of Life* (Philadelphia, PA: New Society Publishers, 1989).

[4]John Schneider, "Small Luxuries of Necessity," *Perspectives* (Aug/Sept 2003): 5–7.

[5]Irwin M. Stelzer, "Irrational Elements of Environmental Policy Making," in *Making Environmental Policy: Two Views*, ed. Irwin Stelzer and Paul Portney (Washington, DC: AEI Press, 1998), 1–29.

[6]Schneider, *The Good of Affluence*, 4.

[7]See Deut. 29:9; Prov. 28:13; Jer. 29:11; John Tiemstra, "Spiritual Poverty, Material Wealth, Conservative Economics," *Perspectives*, (June/July 2002): 6–9; and in *Gods that Fail, Modern Idolatry and Christian Mission* [Downers Grove, IL: InterVarsity, 1996], Vinoth Ramachandra quotes John Calvin as using the term "flourish" to connote something very different from material affluence:

> The earth was given to man, with this condition, that he should occupy himself in its cultivation ... The custody of the garden was given in charge to Adam, to show that we possess the things which God has committed to our hands, on the condition that, being content with the frugal and moderate use of them, we should take care of what shall remain. Let him who possesses a field, so partake of its yearly fruits, that he may not suffer the ground to be injured by his negligence, but let him endeavour to hand it down to posterity as he received it, or even better cultivated. Let him so feed on its fruits, that he neither dissipates it by luxury, nor permits it to be marred or ruined by neglect. Moreover, that this economy, and this diligence, with respect to those good things which God has given us to enjoy, may flourish among us: let everyone regard himself as the steward of God in all things which he possesses. Then he will neither conduct himself dissolutely, nor corrupt by abuse those things which God requires to be preserved (p. 70).

[8]Josephine Mushi, personal communication with David Warners, May 1999.

[9]In *The Poverty of Affluence*, Wachtel writes:

> So long as we persist in defining well-being predominantly in economic terms and in relying on economic considerations to provide us with our primary frame of reference for personal and social policy decisions, we will remain unsatisfied. A central task of this book will be to show how our excessive concern with economic goals has disrupted the *psychological* foundations of well-being, which in a wealthy society like ours are often even more critical (p. 2).

[10]Most ecology and biology texts stress the connection between species loss and human influence; with human influence coming both from overpopulation and overconsumption. Among recent publications that discuss this connection are: Mark B. Bush, *Ecology of a Changing Planet*, 2d ed. (Upper Saddle River, NJ: Prentice Hall, Inc., 2000); D. A. Falk, C. I. Millar and M. Olwell, *Restoring Diversity* (Washington, DC: Island Press, 1996), 4–48; Richard T. Wright and Bernard J. Nebel, *Environmental Science: Toward a Sustainable Future*, 8th ed. (Upper Saddle River, NJ: Pearson Education, 2002); Robert E. Ricklefs, *The Economy of Nature*, 4th ed. (New York: W. H. Freeman, 1997), 593–638; John VanderMeer, *Reconstructing Biology: Genetics and Ecology in the New World Order* (New York: John Wiley and Sons, 1996), 211–54.

[11]This is a rate well documented by paleontologists and ecologists. The best popular author on the topic of extinctions and the likely fallout if this extinction rate continues is David Quammen. See his "Planet of Weeds, Tallying the Losses of Earth's Animals and Plants," *Harper's Magazine* (October 1998): 57–69; and ——, *The Song of the Dodo* (New York: Scribner, 1998).

[12]Lester Brown, *Eco-economy: Building an Economy for the Earth* (New York: Earth Policy Institute and W. W. Norton and Co., 2001); Herman Daly, *Steady-State Economics*, 2d ed. (Washington, DC: Island Press, 1991); ——, *Beyond Growth: The Economics of Sustainable Development* (Boston, MA: Beacon Press, 1996); Bob Goudzwaard, *Idols of Our Time* (Downer's Grove, IL: Inter-Varsity Press, 1981); and Bob Goudzwaard and Harry de Lange, *Beyond Poverty and Affluence: Toward and Economy of Care* (Grand Rapids, MI: William B. Eerdmans Publishing, 1995).

[13]Richard DeVos, *Compassionate Capitalism: Helping People Help Themselves* (New York: Penguin Books, 1994).

[14]Albert Gore, Jr., *Earth in the Balance: Ecology and the Human Spirit* (Boston, MA: Houghton Mifflin, 1992).

[15]Berry, *Sex, Economy, Freedom and Community*; Calvin B. DeWitt, "Seven Degradations of Creation," in *The Environment and the Christian*, ed. Calvin B. DeWitt (Grand Rapids, MI: Baker Book House, 1991), 13–23; and Holmes Rolston III, *Conserving Natural Value* (New York: Columbia University Press, 1994).

[16]Steven Bouma-Prediger, *For the Beauty of the Earth: A Christian Vision for Creation Care* (Grand Rapids, MI: Baker Academic, 2001); Scott Hoezee, *Remember Creation: God's World of Wonder and Delight* (Grand Rapids, MI: William B. Eerdmans Publishing Company, 1998); and Jurgen Moltmann, *Creating a Just Future: The Politics of Peace and the Ethics of Creation in a Threatened World* (Philadelphia, PA: Trinity Press International, 1989).

[17]Joseph Sittler, *Evocations of Grace: Writings on Ecology, Theology, and Ethics*, ed. Steven Bouma-Prediger and Peter Bakken (Grand Rapids, MI: William B. Eerdmans Publishing Company, 2000), 74.

[18]Given such a context, these words from Hosea should command our attention:

> There is no faithfulness, no love,
> No acknowledgment of God in the land.
> There is only cursing, lying and murder, stealing and adultery;
> They break all bounds, and bloodshed follows bloodshed.
> Because of this the land mourns,

And all who live in it waste away;
The beasts of the field and the birds of the air and
the fish of the sea are dying (Hosea 4:1b–3).

[19]In this paper, we largely omit discussion on the potential dangers of an affluence-driven lifestyle on the individual person engaged in such pursuit. Surely, there is much to be said about this; Schneider himself addresses this danger quite clearly and we agree with his warnings (*The Good of Affluence*, 42). What remains unclear to us is how Schneider can so clearly warn against materialism, yet then proceed as if human beings are somehow immune to such dangers.

[20]Colin Gunton is a leading theological voice in promoting a relational understanding of God and of human beings as his image bearers. See especially Colin Gunton, *The Triune Creator: A Historical and Systematic Study* (Grand Rapids, MI: Eerdmans, 1998), 212–36. Also, Loren Wilkinson, professor of interdisciplinary studies at Regent College, has commented extensively on Gunton and expanded on Gunton's theology. See Loren Wilkinson, "The New Story of Creation: A Trinitarian Perspective" *Crux* XXX, no. 4 (Dec. 1994): 26–36.

[21]Steven Bouma-Prediger, personal communication with David Warners, July 2003.

[22]In *Evocations of Grace: Writings on Ecology, Theology, and Ethics*, Sittler describes this mutual co-existence:

> I am stuck with God, stuck with my neighbor, and stuck with nature (the "garden"), within which and out of the stuff of which I am made. I may love God, hate God, ignore God. But I can't get unstuck from God. I may love my neighbor, hate my neighbor, or ignore my neighbor. But I can't get unstuck from my neighbor. And I may love the world, hate the world, or try to ignore the world. But I cannot get unstuck from the world (pp. 203–4).

[23]In *Creating a Just Future*, Moltmann writes:

> In fact people are not only social beings; they also come in generations. They are created as generations. They live with one another and for one another as generations. Therefore human life stands and falls with the preservation or breach of the contract between the generations which is unwritten but lies at the basis of all life (p. 11).

[24]Drawing from writings of Thomas Jefferson and Aldo Leopold, David Orr in "2020: A Proposal," *Conservation Biology* 14, no. 2 (April 2000) develops an ethical principle regarding our responsibility to future generations:

> No person, institution, or nation has the right to participate in activities that contribute to large-scale, irreversible changes of the earth's biogeochemical cycles or undermine the integrity, stability, and beauty of the earth's ecologies—the consequences of which would fall on succeeding generations as an irrevocable form of remote tyranny (p. 340).

[25]Schneider, *The Good of Affluence*, 61.

[26]See Durning, *How Much is Enough?* for a thoughtful treatment of the variety of associated costs implicit in a lifestyle of ever-increasing material affluence.

[27]In *Beyond Poverty and Affluence*, Goudzwaard and de Lange write:

> Therefore, in all areas, including education, we must promote the notion that human well-being, both of ourselves and of others, requires first and foremost a life-style of restraint, not luxury (p. 160).

Also, Herman Daly in *Beyond Growth* comments beautifully on how restraint should be part of a lifestyle of gratitude:

> The world and our lives within it are the gifts of God, for which we should be grateful. Our gratitude and thanksgiving are expressed in worship, *but should also be expressed in restraint*. If we love God we will love God's world. If we are grateful for God's gift of life we will not waste the capacity of God's world to support life. If we love God's world we will try to understand how it works, so that we will not ignorantly harm it, like a curious child playing with a grasshopper. We will learn self-control before presuming to control Creation—taking seriously the Buddhist meditation "Cut down the forest of your greed, before cutting real trees" (our emphasis, pp. 216–7).

[28]Schneider, *The Good of Affluence*, 42–5.

[29]Ibid. Schneider writes:

> ... not just some, but *all* human beings have this authoritative status before God, and *all* human beings are thus called upon to represent on earth God's rule over heaven. To be made in God's image most basically means to have been given dominion over the earth, under God ... Our realm of rule is ultimately not our kingdom, but God's. But as God's, it is ours, too. The peculiar theme of dominion is thus the dominant one in this part of the story (pp. 47–8).

[30]In *Evocations of Grace*, Sittler writes:

> One can rule in many ways. One can rule by "careless" domination; one can rule by subjecting everything to oneself; one can rule by assuming that everything that isn't oneself is good and has value only as it helps oneself. The first is brutish, the second is arrogant, the third is cynical. That kind of rule, in the creation as in a family, is a kind of ruling that is catastrophic. It ultimately destroys the ruler.
>
> But man is to "rule" the earth as God's earth, not man's. It is *for* man, supports man—but it isn't *man's*. Man, who didn't make himself, is placed in a garden that he didn't make, and he is commanded to care for that garden so that God's creation may *be*, so that he himself and his neighbor may *be*. The command to care is gentle; the results of not caring are violent and fatal (pp. 205–5).

For a beautiful biblical description of just what such a ruler will be like, see Psalm 72 where under the ruling of a just king, the afflicted are defended, the needy and their children are saved, and the land will supply the people with bountiful food and beauty.

[31]The etymology of "*radah*," "*abad*" and "*shamar*" has been brought to light by several authors, among whom are Bouma-Prediger (*For the Beauty of the Earth*, pp. 74, 154). A key word that we do not discuss is "subdue" (*kabash*). This concept underscores the participatory influence human beings have in the creation and also suggests that the relationship between human beings and the natural world will at times be difficult. Our omission of *kabash* in this discussion is only because the concept is not specifically raised by Schneider.

[32]The image of a servant runs deeply throughout the scriptures, see Phil. 2:7; Col. 1:20.

[33]While arguing against the enlightenment view that humans are solely individuals, Janel Curry and Steven McGuire give a voice to what Colin Gunton refers to as an "ethic of createdness," arguing that human beings are essentially creatures embedded within community and place. Curry and McGuire present empirical evidence that such embeddedness can be disrupted by the effects of unrestrained global capitalism, particularly as they assess its effects on farming communities. See Janel M. Curry and Steven McGuire, *Community on Land* (Lanham, MD: Rowan and Littlefield, 2002), especially pp. 182–90; and Gunton, *The Triune Creator*, 228–34.

[34]As a brief addendum to this section, we acknowledge that at times Schneider seems to agree with this interpretation. He writes:

> Since it is dominion that represents God's view of nature, and since God's view of nature is that it is sacred, it follows that humans must rule over nature with a respect that is commensurate with that truth. Our role is to set the creation free from harm, to bring out its potential—not to inflict evil upon it (*The Good of Affluence*, p. 53).

It is difficult to understand how Schneider can promote material affluence as a cosmic good yet also hold to such a statement. Our best interpretation of this apparent conflict is that he may not believe that human material affluence has a detrimental effect on the creation. However, as mentioned earlier, we find this connection irrefutable. For further reading we suggest Bouma-Prediger, *For the Beauty of the Earth*; Brown, *Eco-economy*; Bush, *Ecology of a Changing Planet*; Daly, *Beyond Growth*; Durning, *How Much is Enough?* Hoezee, *Remember Creation*; Tom Tietenberg, *Environmental and Natural Resource Economics* (Boston, MA: Addison Wesley, 2003), especially pp. 583–93.

[35]Schneider, *The Good of Affluence*, pp. 30, 31 and elsewhere. Our suggestion that this statement should not be blindly accepted comes from personal experiences in developing countries including Tanzania, Kenya and Belize, where very poor people who recognize their quality of life is dependent on a healthy environment have made great progress in protecting and enhancing their environmental surroundings.

[36]Rolston in *Conserving Natural Value* comments extensively on the unsustainability of our current economic direction. Here are two quotations:

> Perhaps there looms before us what some call, rather dramatically, "the end of nature" (McKibben 1989). Formerly, we could count on the natural givens. "A generation goes, and a generation comes, but the earth remains forever" (Ecclesiastes 1:4). But not any more. In this century, humans have stressed these natural systems to the breaking point. The water is polluted; the soil is degraded; the wildlife are gone or going; forests are cut down; deserts advance on overgrazed lands. Humans are upsetting, irreversibly, even the climate; the change will be disastrous because it will be so rapid that natural systems cannot track it. In the twenty-first century, there will only be nature that has been tampered with, no more spontaneous nature (p. 197).
>
> ... The challenge of the next millennium is to contain those cultures within the carrying capacity of the larger community of life on our planet. On our present heading, much of the integrity of the natural world will be destroyed within the next century. To continue the development pace of the past century for another millennium will produce sure disaster. If we humans are true to our species epithet, "the wise species" needs to behave with appropriate respect for life ... Ultimately, it will involve an Earth ethic, one that discovers a global sense of obligation to this whole inhabited biosphere (p. 206).

[37]Wendell Berry expands considerably on this understanding of "economy" where he refers to the broader economy as "The Kingdom of God" (Berry, "Two Economies," in *Home Economics* [New York: North Point Press, 1987], 55–75).

[38]Calvin B. DeWitt, *The Just Stewardship of Land and Creation* (Grand Rapids, MI: The Reformed Ecumenical Council, 1996), 124–5.

[39]Herman Daly quotes the Russian author and philosopher, Aleksandr Solzhenitsyn, who states this notion quite candidly:

> Society must cease to look upon "progress" as something desirable. "Eternal Progress" is a nonsensical myth. What must be implemented is not a "steadily expanding economy," but a *zero growth economy*, a stable economy. *Economic growth is not only unnecessary but ruinous*" (*Steady-State Economics*, 9).

[40]Wachtel, *The Poverty of Affluence*, 141.

[41]Brown, *Eco-economy*, 11.

[42]Schneider, *The Good of Affluence*, 59.

[43]Wachtel, *The Poverty of Affluence*, 160. Schneider in *The Good of Affluence* is correct in pointing out that while many environmentalists are quick to criticize capitalism, they offer little in the way of alternatives. His emphasis on the good that capitalism has and can produce is also well taken.

[44]Daly, *Steady-State Economics*; and ——, *Beyond Growth*.

[45]Herman Daly, "Farewell Speech to the World Bank" (1994), www.whirledbank.org/ourwords/daly.html. With regard to Daly's third point here, Lionel Basney's writing is enlightening:

> What are the words of the solution? They sound like this: *boots, dirt, watershed, beetle, tomato, compost, rot, stink* and *shovel*. These are the words of proper scale and proper means. For "serving justice" substitute "feeding"; for "community" substitute "Chet" and "the Smiths down the block." For "nature" substitute "backyard" (Lionel Basney, *An Earth-Careful Way of Life: Christian Stewardship and the Environmental Crisis* [Downer's Grove, IL: InterVarsity Press, 1994], 149).

[46]While Lester Brown's whole book *Eco-economy* unfolds the author's concept of what an eco-economy will look like, the following quotation offers an overview:

> ... if the operation of the subsystem, the economy, is not compatible with the behavior of the larger system—the earth's ecosystem—both will eventually suffer. The larger the economy becomes relative to the ecosystem, the more it presses against the earth's natural limits, the more destructive this incompatibility will be.
>
> An environmentally sustainable economy—an eco-economy—requires that the principles of ecology establish the framework for the formulation of economic policy and that economists and ecologists work together to fashion the new economy. Ecologists understand that all economic activity, indeed all life, depends on the earth's ecosystem—the complex of individual species living together, interacting with each other and their physical habitat (p. 4).

[47]We have found Goudzwaard's writing particularly compelling. His voice is one that is beginning to find application in Holland and Germany and one we hope will find an audience here in North America:

> If we take the demands of stewardship seriously, then human dignity in work must be primary. Stewardship, a basic principle of the Torah, requires the use of technologies which are sufficiently labor intensive and which suit human beings and their realm of responsibility. It sets strict limitations on the plunder of the environment. If one honors these requirements (thus having enough flexibility to reject objectionable defense contracts or to abandon risky forms of energy development), then income and consumption levels will indeed drop. On the average these levels will be lower than the levels to which we are now accustomed. But we will have deliberately chosen them for the sake of meaningful work, a clean environment and a sufficient amount of extra income for transfer to the poorest countries. We will have moved from biblical norms to responsible production and consumption levels.
>
> Our current economic thinking and social system work in the opposite direction of the Torah. Maintaining economic growth is our first priority. *Then* arise questions of what to do with the resulting unemployment, the dehumanization of work, the rape of the environment and other problems. Our priorities constrain us to use increasingly large-scale technologies and to accept weapons contracts from wherever they come. These are obvious signs of our slavery to an ideology of prosperity.
>
> No shalom awaits those who follow this ideology (Goudzwaard, *Idols of Our Time*, 104–5).

[48]Steven Bouma-Prediger inspiringly writes:

> Christian eschatology is earth-affirming. Because the earth will not be "burned up" but rather purified as in a refiner's fire, we can act with confidence that our actions today are not for naught. Because we await and yearn for a renewed heaven and earth, we can work in expectation that our faithful deeds here and now will be gathered up in the eschaton. Because we rely on God's promises despite the despoliation of our planetary home the whole world is, as the song says, in God's hands. In practical terms, if our news is truly good, then recycling and composting and bicycling to work are not whistling in the dark. They are, rather, hope-filled ways of living in harmony with God's own loving, restorative way with the world (Bouma-Prediger (2002), 126.

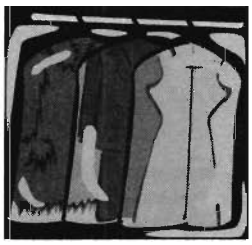
[49]Berry, *Sex, Economy, Freedom and Community*, 109–10; See also ——, "The Idea of a Local Economy," *Orion* (Winter 2001): 28–37.

[50]David Wise, "A Review of Environmental Stewardship Literature and the New Testament," in *The Environment and the Christian: What Can We Learn from the New Testament?* ed. Calvin B. DeWitt (Grand Rapids, MI: Baker Book House, 1991), 126.

[51]Schneider, *The Good of Affluence*, 63.

[52]The book of Isaiah is rich in imagery showing that when God blesses, this blessing will be realized not only by people, but the land itself will also benefit. Numerous texts give indication of what this coming shalom will look like. See, for example, Isa. 35:1–7.

[53]Basney, *An Earth-Careful Way of Life*, 161.



**Article**

*"And Why Do You Worry about Clothes?" Environmental Ethics and the Textile Complex*

# "And Why Do You Worry about Clothes?" Environmental Ethics and the Textile Complex

*Lorynn Divita*

Lorynn Divita

*Clothing and textiles are two of the few consumer products mentioned in the Bible that are still as commonly used ... today as in scriptural times.*

*The production of textiles and apparel are among the most ancient industries in the world. They are two of the few consumer products mentioned in the Bible that are still in common use today. Our apparel binds us together inextricably to the earth in two ways: by allowing us to exist, shielding us from harsh conditions; and through the impact textile and apparel production methods has on the natural environment. It also binds us together socially and in powerful metaphorical ways as well.*

*Despite the fact that production methods have evolved, many key environmental issues still plague the textile complex at every stage of production, from fiber manufacturing through sewing and distribution. This paper examines the environmental issues throughout the textile and apparel industry and attempts to interpret them in a Christian environmentalist perspective. The textile complex illustrates how environmental issues that challenge any industry can be interpreted from an ethical, Christian perspective.*

> *"And why do you worry about clothes? See how the lilies of the field grow. They do not labor or spin. Yet I tell you that not even Solomon in all his splendor was dressed like one of these. If that is how God clothes the grass of the field, which is here today and tomorrow is thrown into the fire, will he not much more clothe you, O you of little faith?"*
>
> *– Matthew 6:28–30, New International Version*

Clothing and textiles are two of the few consumer products mentioned in the Bible that are still as commonly used, with much of the same intent, today as in scriptural times. References to clothing and textiles are prominent throughout both the Old and New Testaments of the Bible. The first reference to clothing in the Bible occurs in Gen. 3:7: "Then the eyes of both of them were opened, and they realized they were naked; so they sewed fig leaves together and made coverings for themselves" (NIV). The NIV has over three hundred references to the word "cloth" and its variations. These references take many forms. Several passages refer to proscriptive dictates on human's dress (Lev. 10:6, Deut. 22:5, 11; Eccles. 9:8), and prescriptive ones (Lev. 11:25; Num. 4:6–13; 8:21 and others) telling how clothing should or should not be worn and cared for. More interestingly, the Bible is full of symbolic imagery regarding clothing and its manufacturing process that underscores its importance in everyday life. Birth, life, and death are each likened to the making of cloth. In Ps. 139:13 ("... you knit me together in my mother's womb"), the beginnings of human life are compared to setting up a loom, with

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God as the weaver and the mother's womb as a loom. When Job (11:10) describes how quickly his life is passing, he uses the metaphor: "My days are swifter than a weaver's shuttle." And when Isaiah (38:12) writes of the end of life and of dying, he does so by comparing the process to how a weaver removes fabric from the loom: "... like a weaver I have rolled up my life; he cuts me off from the loom."[1]

*Despite the fact that textile and apparel production has undergone many changes and improvements, many key environmental issues still plague the industry at every stage of production, from fiber to fabrication and beyond.*

Clothing also can represent God's relationship with humans. After Adam and Eve make fig-leaf loincloths for themselves, they distance themselves from their Creator. But by making and giving them "garments of skin" (Gen. 3:21), God then reaffirms a personal bond with them, while the gift of clothes from a common giver binds the couple together. The Bible shows at this early point that clothing is a necessity of life. Some people in biblical times felt that weaving skills were bestowed by God (Exod. 35:30–35), and the cloth maker responded to divine inspiration when weaving, so there was a spiritual connection between God and the clothing they produced. A seamless garment was thought to have an "endless warp" which represents unbroken threads of relationship and ancestry going all the way back to God himself. People believed that the endless warp transmitted a spiritual force, and to cut a seamless garment would refute this belief and displease God. This idea may be why in his Gospel the apostle John (19:23–24) thought it worthy of mention that Jesus' tunic at his crucifixion was seamless, but also why the soldiers declined to tear the garment, deciding instead to cast lots for it.[2]

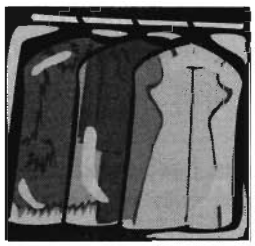
In modern times, our clothing separates us from the earth and each other. Dress is unique to human beings, and distinguishes us from members of the nonhuman kingdom. One of the primary functions of dress is to provide a barrier between others and ourselves, permitting us to feel modest in the presence of other human beings. At the same time, our clothing binds us inextricably to the earth in two distinct ways. The first and most obvious is clothing allows us to exist in the world by shielding us from the earth, including the elements, insects, and rough or abrasive plants. Technological advances in "performance apparel" permits humans to exist even in extreme living conditions. Apparel products today may have built-in sun protection factors and the ability to wick moisture away from the body. A second way in which clothing binds us to the earth is through the impact that textile and clothing production methods and retailing have on the natural environment. These issues affect our planet and the beings that inhabit it. Despite the fact that textile and apparel production has undergone many changes and improvements, many key environmental issues still plague the industry at every stage of production, from fiber to fabrication and beyond.

The goal of this paper is to provide (from a Christian environmental viewpoint) a comprehensive overview and critique of environmental problems at each stage of the production, consumption, and disposal process. This Christian environmentalist viewpoint is based on maintaining a community-centered focus from both the corporate and individual perspective. Corporations are responsible for the just treatment of the people who work for them and for the stewardship and natural preservation of communities in which they are located. Likewise, consumers are people who live in communities and their clothing choices (e.g., whether to dry clean or wet launder) are not isolated; they also have an impact on the community. Seeing the entire chain of events (from production through purchase, consumption, and disposal) in its entirety is important because, as Wendell Berry writes: "The significance—and ultimately the quality—of the work we do are determined by our understanding of the story in which we are taking part."[3]

This topic is of importance because comparably little attention is paid to the environmental impact of the textile complex relative to higher-profile industries that more obviously consume natural resources, such as oil and coal production. The numerous articles that do examine the environmental impact of the textile complex are narrow in scope and written from a secular viewpoint.[4] Despite the current focus on the textile complex, this same process of analysis could be used for virtually any manufacturing industry to help Christians who are employed at such a company to make choices that will not force them to choose between their faith and their profession.

## The Textile Complex Production Process and the Environment

The textile complex (see Figure 1) "refers to the industry chain from fiber to fabric, through end uses of apparel, interior furnishings, and industrial products."[5] Several characteristics involved both in the production and consumption of textile products such as clothing, towels, and bedding make them unique from durable consumer



# Article

## *"And Why Do You Worry about Clothes?" Environmental Ethics and the Textile Complex*

*Several characteristics involved both in the production and consumption of textile products ... make them unique from durable consumer goods ...*

goods such as refrigerators or washers and dryers. These differences include a lack of automation in apparel assembly, large water consumption, and a more rapid fashion cycle in comparison to durable goods.

The structure of the industry makes it unique as well. A great range of diversity in size and type of operations exists between plants. Some plants are small and perform a limited range of functions, such as spinning raw fiber into yarn or weaving yarns into unfinished fabrics, while other plants may be vertically integrated, handling the entire manufacturing process from raw fiber to finished fabrics ready for end use. This range means that production methods (even for similar fabrics) vary greatly among plants, which results in individualized pollution control as opposed to an industry-wide cooperative program.

A second defining characteristic of the structure of the textile industry is the geographic concentration of manufacturing locations. In the United States, the highest concentration of textile and apparel manufacturing is in four southeastern states: North and South Carolina, Georgia, and Alabama. Although many domestic textile and apparel plants have closed in the last decade (e.g., in the years 1992–2002, the textile industry lost 220,000 jobs, or one-third of its workforce; and the apparel industry lost 400,000 jobs, or 40% of its workforce),[6] the diversity in plant size and geographic concentration of manufacturers are also common to textile and apparel production in other countries.

### The Production Process

The textile complex involves multiple manufacturers whose final product becomes the building block for the next production stage. The first stage of the production process is fiber manufacturing, which takes fibers from natural sources, such as cotton or wool, and uses them in their existing form, or converts products such as oil or wood into manufactured fibers such as polyester. The next stage is yarn production, where raw fibers are twisted to form yarn. Textiles are then pro-

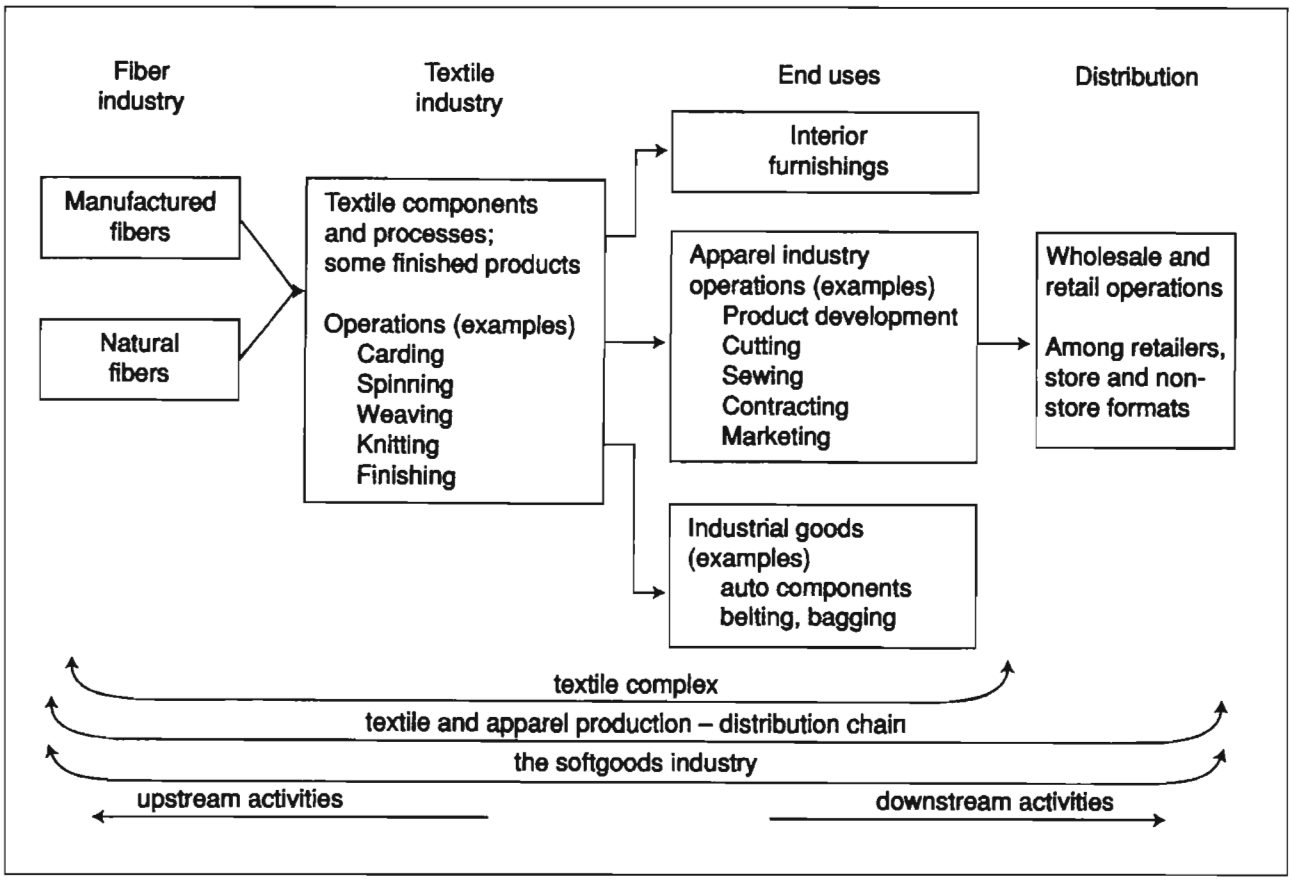



**Figure 1.** Diagram of the Textile Complex and Related Industries. From K. G. Dickerson, *Textiles and Apparel in the Global Economy*, 3rd ed. (Upper Saddle River, NJ: Prentice-Hall, Inc., 1999).

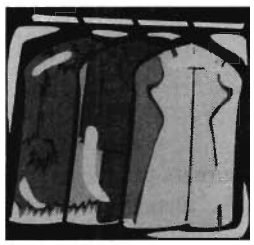
duced by taking yarns or fibers and connecting them using one of two main fabrication methods: weaving (for fabrics such as denim, oxford, or taffeta) or knitting (for fabrics such as tricot, jersey, and rib). After the textile is fabricated, the material is finished to impart certain performance properties such as resistance to water, stains, static, abrasion, or wrinkling. The final step in textile production is adding color to the fabric through various dyeing and printing methods. The finished fabric is then shipped to apparel manufacturers, where it is cut and sewn into garments for consumers to purchase in a retail environment. The relationship between the product and the planet does not end with manufacturing, however. The packaging methods of retailers, the amount of apparel consumers purchase, and the choice of garment care methods and disposal habits by consumers can further heighten the cumulative effect of textile and apparel products on the environment.[7]

## Environmental Issues

A table identifying the impact negative environmental effects that may occur at each stage of the textile complex during the production process and beyond is provided in Table 1. These violations take many forms. They include land use issues such as overgrazing and water contamination from the cultivation and harvest of natural fibers such as cotton or wool, or worker health and safety issues from

**Table 1. Environmental Challenges at Each Stage of the Textile Complex**

| Production Stage | Environmental Challenges |
|---|---|
| **Fiber Production** | Natural fibers:<br>• Chemical use (for fertilizer, insecticide, growth control, harvest management, and cleaning)<br>• Bioengineering (cotton)<br>• Irrigation (cotton)<br>• Soil erosion<br>• Overgrazing and water contamination (wool)<br>Manufactured and Manufactured Cellulosic fibers:<br>• Oil consumption<br>• Chemical processing<br>• Harvesting of raw materials (trees)<br>• Recyclability |
| **Yarn Production** | Fiber waste - mote (dust) together with short fibers, plant waste, soil, or other elements. |
| **Textile Production** | Weaving:<br>• Water diversion rates (to power looms)<br>• Energy consumption (to dry fabrics from water-jet looms)<br>Finishing:<br>• Water diversion rates<br>• Energy consumption<br>• Chemical processing<br>Dyeing and Printing:<br>• Release of dyes, pigments, and other chemicals containing color, salt, acids, and heavy metals into water systems |
| **Apparel Production** | Waste production:<br>• Textile (from scraps after the pattern is cut out)<br>• Paper (discarded patterns)<br>• Bobbins (industrial-sized spools of thread)<br>Human Capital—sweatshops, community development |
| **Post-Production** | Retail:<br>• Energy consumption (transportation)<br>• Landfill disposal (plastic garment bags and hangers)<br>Post-Purchase:<br>• Laundering (water use and energy consumption)<br>• Dry-cleaning (use of perc)<br>Post-Consumption:<br>• Landfill disposal<br>• Donation/Recycling |



# Article

*"And Why Do You Worry about Clothes?" Environmental Ethics and the Textile Complex*

*Because clothing does not appear to have an obvious effect on the environment as something like coal mining, or to cause harm to someone in the way that guns can, and because clothing is a true necessity, some may think that there is no moral component associated with clothing manufacturing.*

the production of mote, a small particle of fiber that is the cause of "brown lung" among textile workers, to landfill consumption from discarding textile scrap waste and packaging materials. The chain does not end with purchase, however. The consumer's choice of whether to wet launder or dry clean and whether to discard their clothing into the landfill or alternately recycle or donate it to a charitable organization for reuse all contribute to the cumulative affect clothing and textiles have on the environment.

## Biblical Concerns and Principles

Clothing is significant to humans. Clothing and textiles lie in close proximity to our God-given forms throughout our daily lives. They provide protection and a means of personal expression. The close relationship between clothing and textiles to humans and to the earth, as described in the introduction to this paper, was clear to the apostle Paul, who likens our bodies to a tent when he writes in 2 Cor. 5:1-4 (NIV):

> Now we know that if the earthly tent we live in is destroyed, we have a building from God, an eternal house in heaven, not built by human hands. Meanwhile we groan, longing to be clothed with our heavenly dwelling, because when we are clothed, we will not be naked. For while we are in this tent, we groan and are burdened, because we do not wish to be unclothed but to be clothed with our heavenly dwelling, so that what is mortal may be swallowed up by life.

Uses of textile and apparel metaphors in describing the earth still are embraced today by modern-day theologians. For example, Steven Bouma-Predger uses the phrase "no evil woven into the warp and weft of creation," in his book, *For the Beauty of the Earth: A Christian Vision for Creation Care*. And Joseph Sittler writes that "light is a garment the deity wears and the heavens a curtain for his dwelling."[8]

Human beings are a part of nature, and clothing is one of the three basic necessities that allow us to exist in nature—a true gift from God. But it is precisely the ubiquity of clothing and textiles in our daily lives that has made us overlook the impact that our clothing choices have on the environment. Because it is a necessity, we forget that there is a moral component to our clothing. It is easy to view extravagances such as designer apparel costing hundreds of dollars as wasteful. But, in fact, the type and amount of apparel we all consume and how we care for it and discard it after we are done have just as much impact on the environment as someone spending a great deal more.

The same may be said for the manufacture of clothing. Because clothing does not appear to have an obvious effect on the environment as something like coal mining, or to cause harm to someone in the way that guns can, and because clothing is a true necessity, some may think that there is no moral component associated with clothing manufacturing. Whatever production processes are necessary to produce clothing in this view are acceptable. This is simply not true. For example, textile and production has been shifted in the past to countries with less stringent environmental laws than the United States. It is important to remember that just because it is not illegal to pollute in these countries, it is not right. As Christians we answer to a higher power than the government of any country. Therefore, it is necessary to examine a set of principles that Christians can live by to ensure that all of their choices are moral, including the mundane ones such as clothing.

Authors have addressed environmental issues from a Christian perspective, looking at the role of both the individual and of industry as participating members of both natural and social communities. Bouma-Prediger describes a multi-faceted Christian ethic of care for the earth that may be adopted by consumers and corporations. The central focus of this ethic is recognizing and embracing the relationality that binds all creatures, human and nonhuman, to each other and to the earth and letting that be a guide for our decisions. By putting God first, and not considering humans to be separate from one another because of geographical distances, or separate from the creatures on the land and in the sea, we begin to take responsibility for the preservation and well-being of those relationships and should let that guide our decisions.[9] For example, we as employers (and as customers benefitting from the products workers make) are as responsible for worker health and safety in far-off countries that may not have legal and

governmental protections for workers as we are for workers in our own town. As members of the same global community, our belief as God-centered Christians mandates it. Likewise, when companies select harmful dye or finishing methods we are as responsible as they are for the marine life where the wastewater will be discarded, and for the people that use that water.

Another example would be to consider the impact that landfilling textile scrap waste has on communities, as opposed to recycling these materials into products like fiberfill for pillows. Although recycling textile waste requires more effort, textiles break down slowly in landfills and may have chemical runoff from dyes and finishes. Just because we cannot see this happening where we live does not make it acceptable. As a member of the community in which its goods are produced, corporations have a responsibility to make choices that will benefit all members of the community. Consumers can get informed about their purchases as well, and with this knowledge support those manufacturers who recognize these relationships and strive to maintain them.

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*Textile and apparel companies throughout history have been less notorious for their environmental infractions than for their human rights violations.*

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The association between industry and the environment has long been a contentious one. Textile and apparel companies throughout history have been less notorious for their environmental infractions than for their human rights violations. The first textile barons were men of principle who cared for their employees (who were mostly women), giving them a livelihood as well as providing them with lodging, entertainment, and a moral upbringing. But as larger profits stood to be earned from working employees long hours, a new class of exploitative mill owners replaced these men.[10] This exploitation has continued in developing countries and even in the United States where underground sweatshops are still run in places like Los Angeles. The argument has been made that environmental and human rights abuses are just a necessary step in a country's road to development, but it does not have to be so. The industry's constant search for low wages is another way in which apparel manufacturing can hurt communities. For example, the VF Jeanswear company recently announced that it would be laying off 1,035 employees from its El Paso, TX plant in November 2004. This announcement was just the latest blow to apparel manufacturing in El Paso, which had declined from over 21,000 jobs in 1993 to less than 4,000 in 2003. In many cases, the terminated employees do not have a high school equivalency degree and are not fluent in English, making their job prospects bleak.[11]

In *Community on Land,* Janel M. Curry and Steven McGuire provide an extensive history of the corporation as an entity and its effect on the social order and environment. They link the rise of corporate power with the concomitant declining power of the individual, resulting in a distancing of the relationship between nature and individuals. This weakened relationship between individuals and nature makes it necessary for the government to step in and limit the impact that individuals and corporations have on the environment. The authors advocate using the land itself as a guide to rediscovering identity, community, and the concept of what it means to live in a place, enabling environmental problems to be viewed with a complete perspective.[12] If corporations recognize the importance of their role within the community and take responsibility for the impact their decisions make on that community, their decisions might be very different. I am using the textile complex to illustrate how easily this may be done.

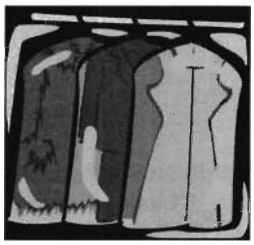
Agricultural essayist Wendell Berry is one of the relatively few writers who has conscientiously combined Christian concern for the environment with industrial policy.[13] He states that the call is clear for industry to avoid profit at the expense of the environment because the world does not belong to us but to God. It is our responsibility as his followers to be good stewards of the land. He says:

> Obviously, "the sense of the holiness of life" is not compatible with an exploitive economy. You cannot know that life is holy if you are content to live from economic practices that daily destroy life and diminish its possibility.[14]

Berry also believes it is entirely possible for humans to live and work in the world and use their work as an opportunity to honor God, not separate themselves from him. This work does not have to be religious work; it can be of any type at all. "To work without pleasure or affection," he writes, "to make a product that is not both useful and beautiful, is to dishonor God, nature, the thing that is made, and whomever it is made for."[15]

## Available Alternatives

Environmentally favorable alternatives that do not conflict with Christian ideals exist for manufacturers to employ at each stage of the textile complex. At the fiber manufacturing level, *organic* or *transition* cotton grows without the use of synthetic commercial pesticides or fertilizers, but costs approximately twice as much as conventional cotton due



# Article

## *"And Why Do You Worry about Clothes?" Environmental Ethics and the Textile Complex*

*The American Textile Manufacturing Institute, the foremost trade group of the textile industry, has recognized the importance of a commitment to the environment. It bestows its Encouraging Environmental Excellence award to members of the textile and apparel industry that demonstrate a concern for the environment by meeting a set of criteria ...*

to the lower crop yield and processing requirements. *Naturally-colored cotton* may be grown in shades of brown, rust, red, beige, and green and sells for the same price as organic cotton. Synthetic fiber manufacturers have environmentally friendly alternatives as well. Some types of nylon carpet may be recycled by converting the carpet fiber to caprolactam, a nylon 6 raw material, for reuse. Polyester fibers made from recycled soda pop bottles are popular with consumers and may be used in apparel and carpeting.[16]

Yarn manufacturers can reduce and recycle their waste. Waste from the yarn spinning process is now available to manufacturers who can use it to manufacture yarns for use in apparel, home furnishings, and industrial products. Improvements in machinery have reduced inefficiencies and improved quality of fabric production, resulting in less wasted fabric. Textile manufacturers also have environmentally-friendly options. Finishing plants now employ systems to control air and water pollution and hazardous waste disposal, and to reclaim and remove contaminants before releasing water back to municipal systems through membrane technology and reverse osmosis. In addition, biodegradable finishes are gaining in popularity. Natural dyes exist for fabrics such as cotton, wool, and silk. Lower-sulfide sulfur dyes use significantly less salt, and dyes that use iron instead of chromium are preferable for safety. Water treatment methods have improved. Color in water systems may be treated through hyperfiltration, electrochemical methods, ozonation, and chemical coagulation. Use of liquid carbon dioxide or supercritical carbon dioxide instead of water in dyeing polyester is under research. This requires less energy and waste treatment, uses no salt or other chemicals, and is recyclable and nontoxic.[17] If corporations used Christian care ethics as the basis of their business decisions, these alternatives would be industry standards instead of merely options.

The American Textile Manufacturing Institute (ATMI), the foremost trade group of the textile industry, has recognized the importance of a commitment to the environment. It bestows its Encouraging Environmental Excellence (E3) award to members of the textile and apparel industry that demonstrate a concern for the environment by meeting a set of criteria established by the group. The program has received praise from the Environmental Protection Agency (EPA), which has called ATMI one of the most proactive trade associations on pollution prevention. The EPA also has stated that members of the E3 program have done an outstanding job of reducing waste and improving the environment.[18]

Some manufacturers are gaining a competitive advantage by rethinking the entire manufacturing cycle. Reducing the amount of materials used in each step, and especially in packaging, shipping, and display increases profits and reduces environmental impact. One example of this is the technology for reducing paper consumption. This could easily be employed by the textile industry through the elimination of paper markers (patterns) which are no longer needed in many cases because pattern cutting is done by computers using lasers rather than my hand. This savings could in turn be passed along to the customer.

By experimenting with alternative corporate structures, some manufacturers are experiencing great success. One such alternative structure involves leasing products instead of purchasing them outright. For example, the Dow Chemical Company in addition to leasing organic solvents to clients also will recover the solvent after it is applied and take it away. Another example is Interface, a carpet manufacturer, that instead of manufacturing carpet the traditional way makes carpet "tiles" which may be replaced individually as needed. This requires fewer yards of carpet consumed (because only the worn out spots have to be replaced). And, like the Dow Chemical example, it clearly links the manufacturer of the product with its ultimate disposal.[19]

Social concern within the textile complex extends to human capital as well. Some members of the apparel industry have experimented with alternative corporate structures to insure that corporate profits do not supersede the well-being of their employees. American Apparel, a Los Angeles-based manufacturer and retailer of T-shirts and other active-wear, is an example. The company states that it does not use subcontractors or sweatshops, and that all of its products are

made in its own plant located in downtown Los Angeles, where sewers can earn more than $15 per hour. The company's 1,300 employees also receive access to health insurance for children (whether or not they are documented residents), dental insurance for under $1 per week, and free on-site massages.[20]

Profit from a commitment to the environment is not limited to manufacturers. The Swedish retailer IKEA made a commitment to waste reduction and the use of environmentally sustainable materials in the manufacturing of their products. This environmental perspective called "The Natural Step" or "TNS" is now a core part of the IKEA corporate philosophy and is central to all product design.[21]

## What Christians Can Do

In order for employees of corporations to act according to Christian principles, they must consider the corporation itself to be a member of nature and in particular a member of the community in which it does business, accepting all of the accompanying responsibilities with these relationships. Corporations must hold a commitment to justice for people and for nature on a par with their financial commitments to shareholders. A corporation is no less a steward of the environment than an individual is, and it has the power to impact numerous lives simultaneously, making the need for conscientious, ethical executives all the more dire.

Individuals have multiple opportunities to make choices in their textiles and apparel consumption, use, and disposal that can greatly reduce their impact on the environment. A key component of making environmentally correct choices is to adopt a Christian view of personhood—each one of us is a part of nature and a member of a community, not just a consumer. The choice that makes the most direct impact is simply to purchase fewer clothes. The average American owns seven pairs of blue jeans. Most of those pairs likely have only minute variations, but American consumers have adopted the belief that they must have variety in their wardrobe, so they continue to buy. The result is people amass garments that they do not wear often, that sit at the back of the closet while only one or two "favorite" pairs (which maybe all that someone may actually need) are worn frequently.

Related to this is the temptation to follow fashion. Our culture is one that disposes of clothing not because it is no longer functional, but because we perceive it to look dated. This is because apparel companies create "planned obsolescence" by slightly altering garment colors, cuts, and embellishments each season. Because of the rapid production cycle and mass production, it is possible for consumers (particularly younger consumers) to purchase merchandise cheaply with the intent of only wearing it one season, or as long as a trend lasts.[22] If consumers purchased only high-quality, classic apparel and replaced garments only when they became worn-out, consumption would drop dramatically. Christians need to remember that our identities are not defined by any of our material possessions, especially our clothing. To put staying constantly "in fashion" above our duty of being good stewards of the earth is to dishonor God.

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*A key component of making environmentally correct choices is to adopt a Christian view of personhood – each one of us is a part of nature and a member of a community, not just a consumer.*

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Purchasing clothing that may be laundered instead of dry cleaned is another option. The problems associated with the dry cleaning solvent PERC (tetrachloroethylene) far outweigh the water consumption of home laundering. A knowledge of textiles would help consumers, as well, because many garments labeled "Dry Clean Only" may actually be laundered safely at home. How clothing is handled after it is no longer wanted also has an impact. In addition to donating textiles and clothing to charity, some communities offer textile and clothing recycling programs along side more standard recycling programs. Taking advantage of these options keeps used clothing out of landfills.

Consumers may also choose to support companies that are known for ethical treatment of employees or those that make care for the environment a priority. Resources exist for consumers to determine which companies are compliant with the US Department of Labor's (DOL) monitoring program. Currently, the DOL lists thirty-four companies on its "Trendsetters" list, which represent 125 apparel lines and several thousands of retail stores across the country.[23]

## Conclusion

It is apparent that it is possible for textile and apparel manufacturers and consumers to be both environmentally and socially ethical by adopting a Christian viewpoint for their business practices and usage habits. Doing so means recognizing the relationships between humans, non-humans, and the earth in the locations where clothing is made, purchased, and worn (i.e., just about everywhere). Adopting this viewpoint would not be in conflict with non-Christian cultures. Many of the manufacturing components of the textile complex are currently being done

in the Far East, where the majority of residents are not members of the Christian faith. However, in many cases the headquarters of these plants are in the United States, and since the values espoused in this article do not conflict with any of the tenets of these other religions, parent companies can adopt environmentally responsible policies without causing a moral dilemma for their workers.

The textile complex has frequently been in the spotlight in the past several years, primarily for the sweatshop issue, but some limited attention has been paid to the environmental impact of textile and apparel production. This attention is likely to grow, particularly in the future as the countries where production is done improve their standard of living. In some cases, the companies involved might never have considered the total impact of their current actions on God's good earth. In accordance with Christian principles, participants in the textile complex should demonstrate a greater concern for the environment and the relationships between its human and nonhuman inhabitants. It is possible for the textile complex to exist in contemporary society in harmony with Christian values and the earth. ✦

## Acknowledgment

The author would like to gratefully acknowledge the Calvin College Seminars in Christian Scholarship program, Christian Environmentalism With/Out Boundaries: Living as Part of God's Good Earth for inspiring and promoting this research as well as the Baylor Horizons Grant Program for funding it. I would also like to thank the four reviewers whose commentary was extremely constructive and helped improve the paper markedly. Thank you for your time and efforts.

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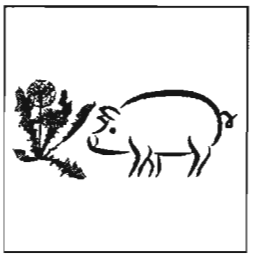



# Paradise Lost? Setting the Boundaries around Invasive Species

*David R. Clements and Wayne V. Corapi*

Photo Courtesy Sabrina Locicero

**David R. Clements**

*The islands of Hawaii are extremely vulnerable to weed invasions. Should it matter to us that this "paradise on earth" is not as it was before these introductions? Do the original Hawaiian ecosystems possess greater intrinsic value than the new exotic plant communities? How do we deal with difficult issues of managing animals (e.g., wild pigs) for the good of an ecosystem? These questions provide a good test for the ethical system of James Nash which calls for individual and collectivist (ecosystem) values to work in concert. Although, from a collectivist standpoint, the pig must go, its individual rights as a sentient organism must be protected. Invasive species are finding themselves in an increasingly borderless world, and as stewards of creation, human beings need to work on setting the boundaries. Restoration of the integrity of ecosystems parallels a broader restoration of society and brings glory to God.*

*For millennia, humanity has been plagued by weeds. ... What is a weed is determined ultimately by a value judgment.*

For millennia, humanity has been plagued by weeds. Weeds have competed for water, nutrients, and light from other plants grown for our sustenance, interfered with our ability to move about freely, disrupted our ecosystems, and blighted our landscapes. In 1912, W. S. Blatchley defined a weed as "a plant out of place or growing where it is not wanted."[1] What is a weed is determined ultimately by a value judgment,[2] most often a negative one. In contrast, Ralph Waldo Emerson saw the more positive side, describing a weed as a "plant whose virtues have not yet been discovered."[3] Interestingly the Bible portrays weeds in somewhat ambiguous terms. In Gen. 3:17-19, God said to Adam: "Cursed is the ground because of you; in painful toil you will eat of it for the rest of your life. It will produce thorns and thistles for you, and you will eat the plants of the field. By the sweat of your face you will eat your food."

While it might be argued that weeds therefore are bad, Augustine held that:

> We should not jump to the conclusion that it was only then that these plants came forth from the earth. For it could be that, in view of the many advantages found in different kinds of seeds, these plants had a place on earth without afflicting man in any way. But since they were growing in the fields in which man was now laboring in punishment for his sin, it is reasonable to suppose that they became one of the means of punishing him. Now this interpretation does not contradict what is said in the words, "Thorns and thistles shall it bring forth to you" if we understand that earth in producing them before the fall did not do so to afflict man but rather to provide proper nourishment for certain animals, since some animals find soft dry thistles a pleasant and nourishing food.[4]

Thus, according to Augustine, part of the curse of Genesis 3 is not so much the introduction of new species of plants to plague us but rather the presence of a tangible symbol of our altered relationship with all of creation. While this includes our relationship

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with weeds, it does not necessarily imply that everything about weeds is bad. To ranchers in Australia, *Echium plantagineum* is referred to as Paterson's curse, after the man who allegedly introduced the plant to Australia.[5] However, when biological control against *E. plantagineum* was proposed in 1971, beekeepers rallied against the proposal, calling the plant by its more flattering name—Salvation Jane. One man's curse is another's salvation.[6]

Perhaps part of the temptation to oversimplify our understanding of weeds comes from the rapidity with which many invasive species are now spreading and invading new habitats around the world.[7] As David Quammen sees it, we are now moving toward a "planet of weeds."[8] Although the damage is caused by the weeds themselves, the transport of species by human agency is part of the large scale transformation of the planet by humans as "geographical leviathans."[9]

In February 1999, an executive order was signed by the US President calling for action against invasion of alien biological species in the US. In "war rooms" in the US and elsewhere, scientists and managers are developing strategies against biological invasions. Bruce Babbitt, former US Secretary of the Interior, provided the following rallying cry:

> Each year noxious weeds exact an ever-heavier toll: Farmers and ranchers spend more than $5 billion just for control. Losses to crop and rangeland productivity exceed $7 billion. Weeds infest 100 million acres in the US, spread at 14 percent per year, and—on public lands—consume 4,600 acres of wildlife habitat per day. They diminish or cause the extinction of native plants and animals, a third of all listed species. They homogenize the diversity of creation. They ignore borders and property lines. No place is immune.
>
> In the past it was, again, much easier for an individual, a state, a federal agency to dismiss this invasion as someone else's problem. And so the weeds—slowly, silently, almost invisibly, but steadily—spread all around us until, literally encircled, we can no longer turn our backs on it. The invasion is now our problem. Our battle. Our enemy ...[10]

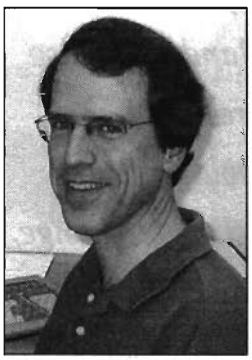
Isolation does not guarantee protection. The Hawaiian Islands have been heavily impacted by alien species. Indeed, most of the flora and fauna visitors are seeing is introduced from elsewhere. Does it matter that this "paradise on earth" is not as it was before this massive alteration of habitat, whether intentional or accidental? Do the original Hawaiian ecosystems possess greater intrinsic value than the new exotic plant communities that are now unfolding? Should attempts be made to restore the former ecosystems? How should communities deal with difficult issues of sacrificing one weed (e.g., a four-legged weed, the wild pig) for the good of an ecosystem? Ecologists have argued that natural ecosystems provide many benefits or "ecosystem services" from clean drinking water and soil to pollination and clean air. Restoration ecology, in fact, has become a multi-billion dollar business.[11]

Because the term "weed" and our concept of "pristine wilderness"[12] are both highly subjective concepts, social values and natural values must be integrated to address the above questions. In this paper, we examine Christian environmental ethics with respect to invasive species. Invasive species are finding themselves in an increasingly borderless world,[13] and as God's stewards of creation, part of the human task is to work on setting the boundaries that will contain them.

*Isolation does not guarantee protection. The Hawaiian Islands have been heavily impacted by alien species. Indeed, most of the flora and fauna visitors are seeing is introduced from elsewhere.*

## Island Invasion: Stepping over the Boundaries of Paradise

The Hawaiian Islands are the most isolated archipelago in the world.[14] Unique plant and animal communities have been produced there, constituted largely of species found nowhere else in the world, and thus vulnerable to the effects of invasive species. Over the apparent seventy million years of Hawaiian history,[15] the islands have been populated by plant and animals species only following very rare colonization events. This is due to the fact that the vast Pacific



Wayne V. Corapi

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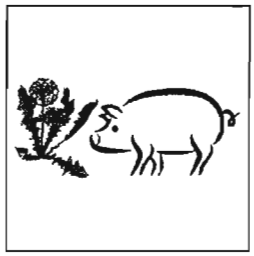


# Article

*Paradise Lost? Setting the Boundaries around Invasive Species*

*The Polynesians had propagated and encouraged pili grass ..., erasing the complex ecosystem which had existed in leeward areas. Previously a dry forest had existed there ... This transformation of the landscape also resulted in widespread climate change, disrupting the hydrologic cycle that allowed trees to grow.*

Ocean served as an effective boundary to "natural invasions," prior to the arrival of the Polynesians.[16]

Island ecosystems are the dynamic result of the complex interaction of geology, climate, and biotic colonization forces. What might they have looked like in the years between 200 and 500 AD? As John Culliney writes:

> We may imagine a bright day and blue sea, boisterous north wind-tossed spray; one or more big double-hulled canoes with ponderous sails – *Pandanus* leaves woven in huge curving triangles mounted point downward – riding ahead of the easterly swell. After weeks on the empty ocean, the travellers must have been unspeakably awed by the sight of these immense unknown islands. Surely, by such experience is a culture's sense of destiny confirmed."[17]

The colonizing Polynesians introduced roughly thirty plant species.[18] Compared to over 1,000 native plants, this does not seem like much. Yet when the Europeans first set eyes on the leeward coasts of the islands in 1778, the landscape was dominated by pili grass (*Heteropogon contortus*). The Polynesians had propagated and encouraged pili grass using frequent fires, erasing the complex ecosystem which had existed in leeward areas. Previously a dry forest had existed there containing its own particular complement of mammals, birds, insects, and other life; four remnant stands of this forest type remain.[19] This transformation of the landscape also resulted in widespread climate change, disrupting the hydrologic cycle that allowed trees to grow.

The Polynesians also had brought exotic animals including the pig (*Sus scrofa*). These pigs caused damage by consuming native vegetation, thus favoring the growth of exotic weeds. Recent research has helped to unearth a picture of the large-scale changes caused by the Polynesians. Patrick Kirch and others have developed a concept of "transported landscapes" explaining how the Polynesians colonized various Pacific islands and transformed them according to their way of life and the species that they favored.[20] The Polynesians were not familiar with the native Hawaiian plants or animals, or their usefulness or management. Should they, because they were non-Europeans, be absolved of blame for their conduct? Several authors think not, suggesting that transforming landscapes is a generic human tendency. It was the island chiefs who exerted much of the power in Hawaiian societies, and this was reflected in extravagant resource extraction. Kirch argues:

> The term *civilization* is appropriate for the level of development realized by the prehistoric Hawaiians. To this one could add, with a naturalist's regret, a crasser manifestation: the sheer magnitude of the transformation of land and destruction of natural ecosystems by the Hawaiians made them the equal of any of their civilized contemporaries.[21]

Beginning with the arrival of the Polynesians, and continuing when Captain Cook "discovered" the islands in 1778, the once virtually impervious boundaries were crossed, as colonizing peoples brought many plants and animals, and the ecosystem was subjected to repeated waves of unprecedented change. The vast majority of species introductions were either well-intentioned or unintentional, but the consequences have been severe. A single seed can quickly turn into a massive invasion. Roughly 10,000 nonnative vascular plants are growing in Hawaii, with at least 1,000 now naturalized (reproducing and spreading in the Hawaiian environment), over and against a native complement of 1,131 species.[22] Kim Sykoryak, a former interpreter with Haleakala National Park suggests: "It would be a tragic loss if we allowed Hawaii's to become just a little more of everywhere else we have been."[23] It is not a little ironic that so many people who have come to "paradise" have sought to "improve it" by modifying the native flora and fauna.

Since the arrival of Europeans in 1778, thousands of additional plants and animals have invaded the islands and many have become "naturalized."[24] Meanwhile, the native organisms have been exploited with little regard for the unique processes of the Hawaiian ecosystem.[25] The Europeans brought a larger, more destructive version of the wild pig. The new type of pig has genetically overwhelmed the smaller Polynesian variety.[26] Now all Hawaiian pigs have predominantly European characteristics, reach-

ing up to five hundred pounds in weight. Extreme levels of habitat destruction seen in the wake of pig activities are partially due to synergistic effects of pigs dining on invasive plant and invertebrate species.[27] This in turn may enhance the propagation of non-native species such as strawberry guava (*Psidium cattleianum*).[28]

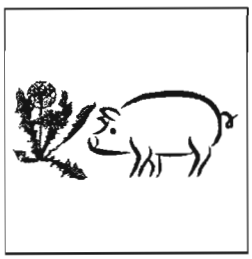
Tourism and agriculture have emerged as major sources of invasive organisms. At any given time, tourists make up around 10% of the human population on the islands.[29] The vulnerable island ecosystem has been continually invaded, through deliberate introductions within horticulture, agriculture, or game hunting, or as stowaways unknown to the humans who facilitate their arrival.

Westerners, like the Polynesians in Kirch's theory of transported landscapes, have brought biological components of their homelands with them. Although many of the organisms introduced to Hawaii's are the results of genuine good intentions, flagrant disregard for the value of the Hawaiian habitat is also apparent in some cases. Recently a reptile trader deliberately imported several species of reptiles and released them in the wild in order to grow and reproduce, so that children could later capture them for a nominal price. The habitat for this entrepreneur was just seen as a means to support a lucrative business.[30] Whether or not introductions are well-intentioned, it is clear that if a higher value was placed on the integrity of the affected ecosystems, greater efforts would be expended to protect Hawaii's from invasions.[31]

## Valuing the Integrity of Creation and the Creatures Within

The word integrity is derived from the Latin *integritas* meaning "untouched" or "entire." Thus, integrity is defined as "an unimpaired or unmarred condition; an entire correspondence with an original condition."[32] To integrate is to "make complete" or whole. Integrity has emerged as a normative term for describing an indicator of the health of ecosystems.[33] Laura Westra has developed the concept of integrity of ecosystems to include the capacity for an ecosystem to retain its specific functions as well as its components (parts and processes).[34] To practice ecological integrity is to integrate environment, conservation, and health.[35] Therefore, conserving original ecosystems should be considered a normative activity.


Kepa Ineole of the Nature Conservancy next to the sign for the Waikamoi Preserve in the Maui rainforest. Although snaring has been used at this site in the past, the relatively low population of wild pigs remaining is controlled by local hunters hired by the Nature Conservancy. *Photo courtesy Darcy Kehler.*



# Article

*Paradise Lost? Setting the Boundaries around Invasive Species*

*James Nash ... explores the apparent dichotomy between valuing an individual and valuing the ecosystem in which it is embedded. At one pole, humanity must affirm the rights of individual lives, ... At the other pole, Nash places the need for holism, for concern about "collective connections."*

Steven Bouma-Prediger further defines such actions as a series of ecological virtues.[36] We are to cultivate respect for the integrity of creation and receptivity to human interdependence with the rest of creation. Drawing from Gen. 1:31, Ps. 104, and Ps. 148, Bouma-Prediger reflects:

> Individual creatures and the earth as a whole have an integrity as created by God and as such have more than merely instrumental value. Creatures exist to praise God and are valuable irrespective of human utility. From this theological theme comes the ethical principle of intrinsic value. Because species have intrinsic value, they have moral standing. All species, like humanity, count morally.[37]

But this valuing of other species does not trump all other values. We are, he says, "to preserve nonhuman species except when other moral considerations outweigh or overrule this duty." Although his emphasis here is on the integrity of individual creatures, we are also obligated to think of communities and preserve habitats "since such species cannot exist without their homes ..."[38] From this he derives the moral maxim: *"Act so as to preserve diverse kinds of life."*[39]

James Nash also explores the apparent dichotomy between valuing an individual and valuing the ecosystem in which it is embedded.[40] At one pole, humanity must affirm the rights of individual lives, not just aggregates of individual organisms. However, the entire hierarchy is connected from individual, to population, to species, to community, and to ecosystem. Although it is more important to preserve a population than an individual, a sufficient respect is required for each individual organism in order to reach the goal of preservation of populations. At the other pole, Nash places the need for holism, for concern about "collective connections." Nash says:

> There is no doubt that systemic wholes, composed of diverse biotic and abiotic elements in interaction, are indispensable instruments—systemic values—for the ends of all rights-bearers.[41]

He points out that a relationship that is unhealthy for an individual (predator-prey relationships, for example) may be useful to the whole.

Aldo Leopold's land ethic reads: "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."[42]

Nash warns that individualistic and more holistic rights must be seen in concert rather than in opposition. He writes:

> The individualistic and collectivistic poles—a rights ethic and a land ethic—must be held in tandem, for ultimately they are not two competing ethics, but complementary sides of one ecological ethic.[43]

This conflict between individualistic and collectivistic ethics is apparent in the issue of the wild pig (*Sus scrofa*) in Hawaii's. The snout of the pig has been a powerful force in breaking up the integrity of the Hawaiian native ecosystem. It fits the expanded definition of a weed as "an [organism] growing where it is not wanted." The wild pig is essentially a four-legged weed.[44] Yet it also stands as one of the things held by some individuals to be quintessentially Hawaiian.

There are only two mammals native to Hawaii,[45] and thus Hawaiian ecosystems were not well-equipped to deal with pigs, which are sometimes described as "animal bulldozers." Wild pigs produce a three-fold impact on the landscape: (1) they promote invasive alien plants by disturbing the ground cover and dispersing seeds; (2) they consume seeds and seedlings of native plants; and (3) they create pools for mosquitoes to breed, spreading avian malaria (*Plasmodium relictum*) to native birds. From a distance, Maui's majestic V-shaped Iao Valley looks to be a rich, dense "natural" subtropical forest, but it is almost entirely composed of strawberry guava promoted by pigs. Parts of Maui at higher altitudes are somewhat insulated from this kind of attack, but virtually no place in these islands is immune.

Two Park Service rangers made the first systematic investigation of the Kipahulu Valley on Maui in 1945. They found that the valley was free of both pig signs and alien plants, and described the valley as an ideal example of untouched "virgin wilderness." They strongly recommended that it be protected.[46] Very few people ventured into the

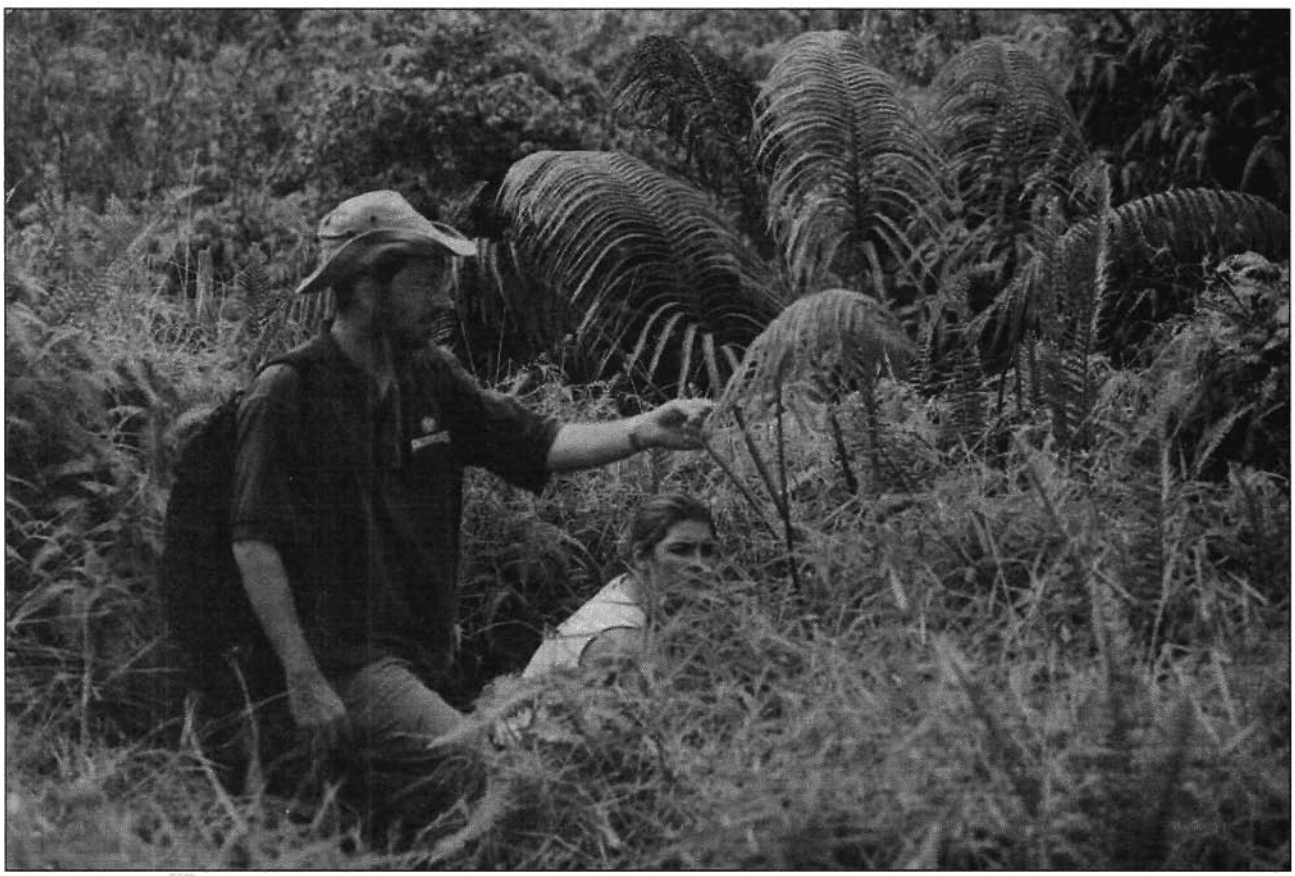
valley over the next twenty-two years, but when a Nature Conservancy scientific expedition conducted a month-long investigation in 1967, it was discovered that incursions of wild pigs had occurred both at the upper and lower elevations of the valley, leaving only the central part of the valley relatively unaffected. By 1976, pigs were clearly moving strawberry guava into much of the valley. It was not until 1982 that managers obtained funding from Congress to begin removing pigs, and by 1989 all pigs were removed by a combination of snaring and fencing. The valley was divided into two management units. The upper unit "once again enjoys almost pure native cover,"[47] but the lower unit is still plagued by alien species because the pigs had been resident long enough to remove so much of the native vegetation that there was little native vegetation to regenerate and compete with alien forms.

At the same time that pigs were being snared in Kipahulu, efforts were being made to manage wild pig populations throughout Hawaii. The rights of the pig did not go unnoticed. Many hunters felt the complete eradication of pigs in particular areas was unwarranted and unfair.[48] In some cases, cooperation has been fostered between pro-hunting groups and game managers.[49] However, Michael Buck, director of the State Division of Forestry and Wildlife admits that the number of game animals will continue to be thinned, to the hunters' chagrin.[50]

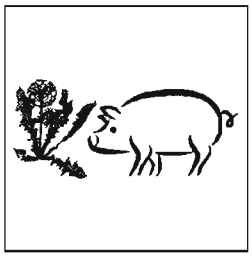
A tract distributed by People for the Ethical Treatment of Animals (PETA) in 1993 contained the following argument: "The Nature Conservancy and others should stop efforts to snare pigs, even if the last vestiges of native forests are destroyed, because Hawaii is not natural anymore, due to introduction of numerous non-native species by Polynesians and European colonists."[51]

Michael Soulé comments that "by claiming that Hawaii is not part of nature anymore, PETA feels justified in giving greater ethical weight to the suffering of individual mammals than to the survival of entire, endemic species."[52] Although Nash advocates seeing the individual and collective poles as different sides of the same ethic, it is difficult to see how the rights of the wild pig can be reconciled with those of an ecosystem largely comprised of endemic species,[53] with plants and birds intertwined by ecological processes that comprise an integrated, interdependent whole, only in the complete absence of the wild pig.[54]

How should the rights of different members or parts of creation be prioritized, whether collective or individual? In many instances, we should refuse to prioritize at all, recognizing with Nash that all is connected – the individualistic and collective aspects are inextricably linked. The spotted owl that was pitted against forestry jobs in the Pacific Northwest is really a representative of the entire



David Clements and student Tara Tosh examining a native *Sadleria* fern on west Maui. *Photo courtesy Darcy Kehler.*



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*What really is needed is a marshaling of resources to serve both poles of the continuum of value articulated by Nash, from individual organism to ecosystem.*

old growth forest. John Muir said that "when we try to pick out anything by itself, we find it hitched to everything else in the universe."[55]

Holmes Rolston III makes a distinction between *intrinsic value* and *instrumental value*.[56] Intrinsic value is what makes an organism good, in and of itself. In Genesis 1, all of creation is called good, independent of its value to humans or other organisms.[57] Yet instrumental value is also evident in the creation account when seed-bearing plants and fruits are singled out as food for both humans and animals:

> I give you every seed-bearing plant on the face of the whole earth and every tree that has fruit with seed in it. They will be yours for food. And to all the beasts of the earth and all the birds of the air and all the creatures that move on the ground—everything that has the breath of life in it—I give every green plant for food. And it was so (Gen. 1:29–30).

Rolston enlarges on subtle distinctions among values placed on different types of organisms, coming up with "rough" distinctions. Looking across various trophic levels, Rolston says:

> Flora and insentient fauna (grass, amoebas) individually have more, yet still weak, intrinsic value [compared to nonbiotic things like rocks] as compared to their crucial instrumental value collectively in the communities in which they are incorporated.[58]

Thus Rolston's ethical system requires that a sentience must be carefully accounted for in terms of intrinsic value.[59]

Snares used in Hawaii are wire nooses placed in areas that are likely to be frequented by pigs. The snares have one-way steel cable mechanisms allowing them to tighten once an animal is caught. They are designed to capture animals by the neck and affect an immediate kill through strangulation, but death does not always come quickly. Animals not positioned correctly in the snare die a slower, more painful death as a result of starvation, dehydration, or bleeding. The Nature Conservancy and other management agencies have argued that "snaring used in combination with fences, is by far the best method in the long run, from standpoints of both ecosystem protection and animal suffering."[60] The argument is that less killing results from snaring than hunting, and thus less cruelty.[61] Still, to argue that snaring is quick and painless is a denial of the obvious; even if the snare is positioned correctly, the resulting death is slower than hanging, and suffering may be exceptionally cruel in some cases. Eye-witness accounts have inspired the case against snaring:

> A hunter on the island of Molakai Hawaii came upon a pregnant pig caught in a snare trap, still alive. Maggots filled her open, bleeding neck, where the wire noose had eaten through to her trachea. She was totally dehydrated ... The torn-up ground around her told of her frantic thrashing that had only tightened the noose further. She looked up at the hunter, too weak to move. He fired a merciful bullet into her, and in her death throes she aborted the babies she was carrying. She was one more victim of The Nature Conservancy's monstrous program to annihilate the free-roaming pigs of Hawaii, pigs brought here by the Polynesians 1,500 years ago.[62]

This PETA report is intentionally nuanced to elicit empathy and pity, and it mistakenly incorporates the fallacy that the pigs are strictly descended from the Polynesian variety. Nevertheless, it rightfully leaves the reader with the unsettling feeling that while the current policies for reduction of the pig population in Hawaii may be effective, they are woefully inadequate.

It is clear that *all* creatures are to be under our care.[63] The pig is simply living out its pigness wherever it finds itself. To protect the integrity of the Hawaiian ecosystem, we should remove the pig that we ourselves placed there.[64] The pig has no instrumental value to organisms other than humans in this habitat, and severely impacts the instrumental and intrinsic value of the ecosystem. However, we are still obliged to respect its intrinsic value. Those involved in snaring do recognize this. Alan Holt, Deputy Director of the Nature Conservancy in Hawaii, maintains: "We only use snares when no other combination of techniques will do the job."[65]

Robert Devine writes that the Nature Conservancy "is just as passionate about protect-

ing the planet's ecological well-being as PETA is about protecting animals from pain and suffering."[66] What is really needed is a marshaling of resources to serve both poles of the continuum of value articulated by Nash, from individual organism to ecosystem. Infrequent monitoring of snares has been defended partly by the lack of sufficient resources. A 1997 article reported:

> Animal rights advocates contend that snares should be checked daily to prevent the drawn out deaths of animals only wounded by the snares. Given the acreage of the refuge's fenced areas alone, and its small staff of 13 (only four of whom are directly responsible for feral ungulate control), daily checking of snares is impractical. From the point of view of refuge staff, snares need only be checked every few weeks to ensure proper functioning.[67]

Passion for the well-being of creation should arouse more than a utilitarian ethic. From a biblical perspective, humans have a priestly role, and we are called to intercede on behalf of creation, seeking to restore proper relationships. This priestly role requires a sacrificial spirit that may impact our time and financial resources. While many will be inspired to offer their help to save a beached whale, the elimination of pigs to save an ecosystem may seem like a less noble and perhaps more ambiguous cause, even though it need not be.

Although in this case study we have advocated the removal of the pig as a harmful invader, the case is not so clear for other "weed" species. It would be impractical and unwise to state that *any* organism transported by humans should be removed, because in many cases removal is nearly impossible and in many cases ecosystem integrity is maintained despite the presence of invasive species.[68] Aside from the particular issue of the pig, there is still a question of "What is natural?" as Soulé pointed out in response to the statement by PETA. Why not have mammals in the ecosystem, especially now that it is so disrupted? Rolston suggests that the introduction of terrestrial mammals to an island chain formerly bereft of them would be consistent with a value system that sees the greatest value in the "higher animals."[69] As human beings we have a strong affinity with creatures most similar to us, and it is not surprising, therefore, that mammalian introductions are made. Just because "we respect the genius of life, ecosystemic integrity and beauty, and so on ... there is no reason to think that all the accidental outcomes of nature are significant or valuable."[70] So why not introduce the higher animals, like mongooses or wild pigs? Why not let domestic cats roam free? Rolston argues that because birds developed dispersal abilities, then the colonization of Hawaii should not be regarded as mere contingency. We would honor the adaptations of birds by letting "Hawaii be an especially remote test of oceanic mobility."[71] However, the Hawaiian ecosystem has become so far removed from its 70-million-year biotic history by the intense perturbations suffered in the last several centuries, that there is some question as to whether the native ecosystems are worth saving. Yet restoration is one of the key themes of Christian earthkeeping and it needs to remain a major consideration.[72]

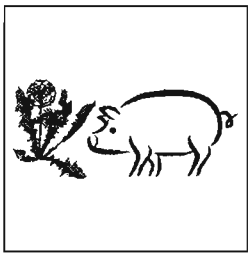
## Restoration of Hawaiian Ecosystems—for God's Glory

Is there any hope of returning to some "natural state?" The tract distributed by PETA bases its argument against the snaring of pigs on the claim that "Hawaii is not natural anymore."[73] Indeed, what is "natural" has become a serious question recently as social scientists have attempted to unearth our social constructions of nature. For William Cronon, the central paradox is that "wilderness embodies a dualistic vision in which the human is entirely outside the natural."[74] The difficulty with this view is that the concept of "nature" outside the influence of humans is a largely untenable and over-romanticized notion, because human influence is all-pervasive in creation. On the other hand, the basic axiom that "nothing is really natural" is overly simplistic and tends to ignore the fact that there are *relatively* pristine areas still remaining. For example, in the Waikamoi Preserve in Maui, the original set of endemic species unique to Hawaii's is more or less intact but very vulnerable, even to human trampling. It is an ecological virtue, as outlined by Bouma-Prediger, to *respect* this integrity. If we were to disregard the relative wholeness of this system, we would not be cultivating respect, but rather conceit, which is "ignorance and disdain for other creatures," and conceited individuals will "if necessary violate the integrity of the other—human or nonhuman—to serve their self-centered interests."[75]

After analyzing the current campaign against invasive species Jason and Roy Van Driesche wrote:

> *Ua mau ke ea o ka aina i ka pono.* "The life of the land is perpetuated in righteousness." This is the Hawaii's state motto, but for the growing number of people who are fighting to protect the things that make Hawaii's unique, it means something more. This phrase implies a duty to protect the *aina*—the land—as the foundation of everything that is Hawaii's. Public awareness campaigns are fundamentally about bringing the state motto to life, for when these words move off the state seal and into the way people live, Hawaii's will have remade itself as a place once again native.[76]

In 1997, biologist Art Medeiros started planting trees to bring back the lost dry forest. A ten-acre exclosure was set up on a cattle ranch on the leeward side of Maui in an area known as Auwahi.[77] As well as excluding livestock and feral animals with the fence, the researchers killed invasive kikuyu grass with herbicides. Numerous native tree species now grow there. Perhaps the most spectacular



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rescue is the successful propagation of the mahoe (*Alectryon macrococcus*). Predation of their fruits by rats had decreased the population of known trees to only a dozen, and only a single plant was left that was able to produce viable seeds. If God speaks to human beings through creation (Rom. 1:20), then "losing a species is metaphorically like tearing a page out of scripture."[78] In the Auwahi project, the simple act of planting trees is preventing that from happening.

*The end result of restoration ... is a display of God's glory, whether its object is a people held in captivity or vegetation like the o'hi'a tree ... held captive to the onslaught of invasive species.*

The restoration of the Auwahi is bringing together various pieces of creation that were nearly lost and put in the dubious category of "remnant." The calling of those remnants back to fullness parallels Israel's own restoration and is a powerful metaphor for the creative and redemptive work of God throughout all of human history. The appropriate response, from human beings and the creation alike, can only be one of joy and thanksgiving. That kind of exuberant joy might even be projected onto the restored forest at Auwahi.

> Sing for joy, O heavens,
> for the LORD has done this;
> Shout aloud, O earth beneath.
> Burst into song, you mountains,
> You forests and all your trees,
> For the LORD has redeemed Jacob,
> He displays his glory in Israel
> (Isaiah 44:23).

Should human beings be involved in restoring ecosystems and freeing them from the presence of harmful weeds and invasive species? The imagery of a future time of unparalleled joy and peace hints at the worthiness of such endeavors.

> You will go out in joy and be led forth in peace ... and all the trees of the field will clap their hands. Instead of the thornbush will grow the pine tree, and instead of briers the myrtle will grow. This will be for the LORD's renown, for an everlasting sign ... (Isaiah 55:12-13).

Where landscapes have been ruined by abusive land use practices, the presence of thorn bushes and briers often provides a stark indicator of its degraded condition.[79] The end result of restoration, however, is a display of God's glory, whether its object is a people held in captivity or vegetation like the o'hi'a tree (*Metrosideros polymorpha*)[80] held captive to the onslaught of invasive species. ✦


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## Notes

[1]Blatchley as quoted in Robert Zimdahl, *Fundamentals of Weed Science* (San Diego, CA: Academic Press, 1999), 15.

[2]There are certain intrinsic biological particularities that are applied to weeds or invasive species, to aid in their classification as such. For example, H. G. Baker developed a list of weedy characteristics, such as high reproductive rate or high capacity for dispersal, but some plants may still be weeds with few or none of Baker's characteristics, so ultimately it is a matter of some aspect that is undesirable from a human standpoint (H. G. Baker, "Characteristics and Modes of Origin of Weeds," in *The Genetics of Colonizing Species*, ed. H. G. Baker and G. L. Stebbins [New York: Academic Press, 1965], 147-68).

[3]Zimdahl, *Fundamentals of Weed Science*,15.

[4]St. Augustine, *The Literal Meaning of Genesis* 1, translated and annotated by John Hammond Taylor, S.J., 2 vols. (New York: Newman Press, 1982), 94.

[5]L. Briggs, "Echium; Curse or Salvation? in *Pests and Parasites as Migrants*," ed. A. J. Gibbs and Meischke (Cambridge, UK: Cambridge University Press, 1985), 152-9.

[6]Biological control agents were eventually released in Australia (see www.ento.csiro.au/redistribution/Pages/patersonscurse.html), but not without extensive consultations and an overhaul of the procedures for dealing with such issues, in recognition of potentially divergent views on weeds (Briggs "Echium; Curse or Salvation?").

[7]D. M. Richardson, P. Pyšek, M. Rejmánek, M. G. Barbour, F. D. Panetta, and C. J. West, "Naturalization and Invasion of Alien Plants: Concepts and Definitions," *Diversity and Distributions* 6 (2000): 93-107.

[8]David Quammen, *The Song of the Dodo* (New York: Scribner, 1996).

[9]Robert David Sack, *Homo Geographicus: A Framework for Action, Awareness, and Moral Concern* (Baltimore, MD: The Johns Hopkins University Press, 1997), 1.

[10]Quote from an address made to the "Science in Wildland Weed Management" Symposium, Denver, CO (April 8, 1998).

[11]M. Palmer, E. Bernhardt, E. Chornesky, S. Collins, A. Dobson, C. Duke, B. Gold, R. Jacobson, S. Kingsland, R. Kranz, M. Mappin, M. L. Martinez, F. Micheli, J. Morse, M. Pace, M. Pascual, S. Palumbi, O. J. Reichman, A. Simons, A. Townsend, and M. Turner, "Ecology for a Crowded Planet," *Science* 304 (28 May 2004): 1251-2.

[12]The theme of our social construction of concepts like "pristine wilderness" is explored in an influential recent book: William Cronon, ed., *Uncommon*

*Ground: Toward Reinventing Nature* (New York: W. W. Norton, 1995).

[13]Chris Bright, *Life Out of Bounds: Bioinvasion in a Borderless World* (New York: W. W. Norton, 1998).

[14]Hawaii's is approximately 2,500 miles from land in any direction.

[15]The Hawaiian Islands provide an "almost perfect chronosequence" whereby a hotspot has existed in a particular location below the earth's crust that has produced the volcanic activity that has produced the Hawaiian Islands in a chronosequence as the tectonic plates have moved over the hotspot. The stationarity of the hotspot has been demonstrated by comparison to other island chains formed similarly such as the Marquesas and Society Islands. The Emporor Seamounts are over 70 to 80 million years old at the northwestern end of the chain, whereas the oldest existing island is Kaui estimated to be 5.1 million years old, and the youngest is Hawaii's (the big island) at less than one million years old (potassium-argon dating). The hotspot currently exists to the southeast of Hawaii's where a new island is anticipated. Information from D. Mueller-Dombois and F. R. Fosbert, *Vegetation of the Tropical Pacific Islands* (New York: Springer-Verlag, 1998).

[16]J. L. Culliney, *Islands in a Far Sea: Nature and Man in Hawaii* (San Francisco, CA: Sierra Club Books, 1988), 32. Scientists have analyzed the theoretical natural colonization of the Hawaiian Islands systematically, incorporating a wide range of factors including seed morphology, the anatomy and physiology of birds that must have been the major seed dispersers, prevailing winds and currents, and potential ancestors from the mainland or other islands. Dr. F. R. Fosberg hypothesized that the 1,000 or so native species could be derived from as few as 272 original plants (F. R. Fosberg, "Derivation of the Flora of the Hawaiian Islands," *Insects of Hawaii* 1 [1948]: 107–19).

Given the age of the present islands of five million years and the beginning of island formation 70 million years ago, a single new colonist would only have to become established at an interval somewhere between 5,000 and 70,000 years (Jason Van Driesche and Roy Van Driesche, *Nature Out of Place: Biological Invasions in the Global Age* [Washington, DC: Island Press, 2000], 46). Thus, the extremely unlikely combination of a seed both arriving from across the great ocean gulf and successfully surviving to reproduce on Hawaii was only required to happen 272 times. The diversity of plants beyond 272 is then assumed to have unfolded via adaptive radiation from the progenitor species.

For example, Gerald Carr and Donald Kyhos hypothesize that the twenty-eight species in the silversword alliance arose from a single seed that arrived on the islands less than ten million years ago (Gerald Carr and Donald Kyhos, "Adaptive Radiation in the Hawaiian Silversword Alliance: Compositae: Madiinae. I. Cytogenetics of Spontaneous Hybrids," *Evolution* 35 [1981]: 543–56). This well-known group of Hawaiian plants consists entirely of endemic species—i.e., species found in Hawaii but nowhere else in the world. The ancestry of these plants is linked to the California tarweeds, relatively small and unassuming plants, especially by comparison to some of the Hawaiian forms. For example, the Haleakala silversword produces a brilliant silver rosette that grows for a number of years before a tall flowering stalk up to 2.5 m high is produced. The unusual morphology and physiology of the silversword, in dramatic contrast to the ancestral tarweed, represent adaptations to the extremes of temperature, exposure to high levels of ultra violet radiation and lack of moisture in the Haleakala Crater on Maui. The rate of endemism among native flowering plants in Hawaii is over 90%, a rate virtually unmatched anywhere else in the world. All of this is to say that because of the long-standing oceanic boundaries surrounding the Hawaiian Islands, the process of natural colonization took a very long time, and involved evolutionary processes unique to the islands, producing a flora designed expressly for these islands alone.

[17]Culliney, *Islands in a Far Sea*, 32

[18]S. H. Sohmer and R. Gustafson, *Plants and Flowers of Hawai`i* (Honolulu, HI: University of Hawaii Press, 1987), 16.

[19]D. Mueller-Dombois and F. R. Fosberg, *Vegetation of the Tropical Pacific Islands* (New York: Springer-Verlag, 1998), 486–91.

[20]Patrick Kirch, "Transported Landscapes," *Natural History* 91, no. 12 (1982): 22–5.

[21]Culliney, *Islands in a Far Sea*, 324.

[22]Jason Van Driesche and Roy Van Driesche, *Nature Out of Place: Biological Invasions in the Global Age* (Washington, DC: Island Press, 2000), 33.

[23]Kim Sykoryak, "Priorities in Paradise: The Value of Conservation Education in Hawai`i," in *Conservation Biology in Hawai`i*, ed. C. P. Stone and D. B. Stone (Honolulu, HI: Cooperative National Park Resources Studies Unit, University of Hawaii, 1989), 227.

[24]Although the term "naturalized" may have a positive ring to it, as mentioned previously, a naturalized species is one that is reproducing and spreading in the new environment. If the species has recently become naturalized, eradication or containment may well be possible, but there comes a point when this may well be impossible (e.g., the starling, *Sturnus vulgaris*, one of the most abundant birds in continental North America, was introduced from Europe).

[25]Ecosystem function of much of the Hawaiian islands, especially at low elevations, had already been modified from its pre-Polynesian state by the Polynesians.

[26]P. Q. Tomich, *Mammals in Hawaii*, 2d ed. (Honolulu, HI: Bishop Museum Press, 1986).

[27]L. W. Cuddihy and C. P. Stone, *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities and Introduction* (Honolulu, HI: Cooperative National Park Resources Studies Unit, University of Hawaii, 1990), 64–5.

[28]L. F. Huenneke and P. M. Vitousek, "Seedling and Clonal Recruitment of the Invasive Tree *Psidium cattleianum*: Implications for Management of Native Hawaiian Forests," *Biological Conservation* 53 (1990): 199–211.

[29]J. Morgan, "Tourism," in "Hawaiian Conservation Values and Practices," in *Conservation Biology in Hawai`i*, ed. C. P. Stone and D. P. Stone (Honolulu, HI: Cooperative National Park Resources Studies Unit, University of Hawaii, Manoa, 1989), 146–53.

[30]Fern Duvall, Hawaiian State Wildlife Biologist, personal communication, May 2003.

[31]The evaluation of ecosystem integrity is complicated by many factors, and in terms of the Hawaiian ecosystem these factors include historical impacts of a relatively long history of invasive species impacts (i.e., since Captain Cook's time and before). However, it is clear that at least certain invading species disrupt a community on a devastating scale. One good Hawaiian example is the weed miconia (*Miconia calvescens*) which quickly became a major target for control in Hawaii because of its history, such as the fact that it came to occupy more than 70% of the forested land in Tahiti after invading there. Rita Beamish, "Hawaii on Front Line to Fight Invasive Species," *Honolulu Star-Bulletin*, Aug. 25, 2002, http://starbulletin.com/2002/08/25/news/story9.html.

[32]Philip Babcock Gove, ed., *Webster's Third New International Dictionary of the English Language Unabridged* (Springfield, MS: Merriam-Webster, 1986).

[33]Bryan Norton, "Improving Ecological Communication: The Role of Ecologists in Environmental Policy Formation," *Ecological Applications* 8 (1998): 350–64.

[34]Laura Westra, *An Environmental Proposal for Ethics: The Principle of Integrity* (Lanham, MD: Rowman Littlefield, 1994).

[35]David Pimentel, Laura Westra, and Reed F. Noss, *Ecological Integrity: Integrating Environment, Conservation, and Health* (Washington, DC: Island Press, 2000).

[36]Steven Bouma-Prediger, *For the Beauty of the Earth: A Christian Vision for Creation Care* (Grand Rapids, MI: Baker, 2001), 137–60.

[37]Ibid., 142.

[38]Ibid., 142.

[39]Ibid., 142.

[40]James Nash, *Loving Nature: Ecological Integrity and Christian Responsibility* (Nashville, TN: Abingdon, 1991), 179–85.

[41]Ibid., 183–4.

[42]Aldo Leopold, *A Sand County Almanac* (New York: Ballantine, 1970), 262.

[43]Nash, *Loving Nature*, 185.

[44]A pig has many similar effects on ecosystem integrity as the plant weeds it helps to spread. Mark Winston in *Nature Wars: People vs. Pests* (Cambridge, MA: Harvard University Press, 1997) likewise employs a very broad definition of "weed" including many four-legged pests such as raccoons. He writes:

> We usually think of weeds as plants, but if we extend the concept to mean any potentially problematic organism that is found out of its natural place, then nature in the city is full of weeds, from dandelions to coyotes, plantain to rats, clover to geese. A deer, coyote, or dandelion in a country meadow is not a weed, but in the city these and many other organisms become problems, and we have had to maintain an extensive infrastructure of urban pest control to deal with them (p. 59).

[45]One is a species of bat, and another is a species of seal.

[46]An account of the recent history of pig impacts on the valley is found in Van Driesche and Van Driesche, *Nature Out of Place*, 11-5.

[47]Ibid., 14.

[48]J. Conrow, "Saving the Aina: Landowners Want to Control Wild Animals and Hunters Want Enough Game," *Honolulu Star-Bulletin News*, April 25, 1996.

[49]On the Big Island, a Natural Area Working Group has been fostering co-operation among groups including the Sierra Club and the Pig Hunters of Hawaii. Common interests include protecting public access, supporting local customs and traditional practices, improving the efficiency of state game managers, controlling logging and halting the expansion of grazing leases. Likewise, Oahu has avoided conflict by cooperating with the hunting lobby. When there is a need to reduce goats or pigs, hunters are willing to come in and help. See J. Conrow and J. Witty, "Negotiation Enters in the Land Picture: The Conservationists and Hunters Do Not Regard Each Other as Fair Game Anymore," *Honolulu Star-Bulletin News*, April 25, 1996.

[50]Conrow "Saving the Aina."

[51]Michael Soulé, "The Social Siege of Nature," in *Reinventing Nature: Responses to Postmodern Destruction* (Washington, DC: Island Press, 1995), 156.

[52]Ibid., 156.

[53]Endemic meaning that these species are unique to the geographic area, and presumably have co-evolved over a relatively long period.

[54]The question that remains unanswered, however, is whether those who support the work of PETA would be satisfied with an alternative method for the reduction of wild pigs that not only preserves the delicate ecosystems of Hawaii, whether indigenous or not, but also minimizes the degree of suffering inflicted on the pigs.

[55]John Muir, *My First Summer in the Sierra* (San Francisco, CA: Sierra Club, 1988), 110.

[56]Holmes Rolston III, *Environmental Ethics: Duties to and Values in the Natural World* (Philadelphia, PA: Temple University Press, 1988), 192-245.

[57]The term "biophilia" coined by biologist E. O. Wilson to recognize the "innately emotional affiliation of human being to other living organisms" is helpful (Edward O. Wilson, *Biophilia* [Cambridge: Harvard University Press, 1984], 1), but on the other hand, it may lead to an inordinate emphasis on our "preferred forms of nature" (John R. Wood, "Biophilia and the Gospel: Loving Nature or Worshipping God?" in *Living in the LambLight: Christianity and Contemporary Challenges to the Gospel*, ed. H. Boersma [Vancouver: Regent College Publishing, 2001], 153) and God's pronouncement of goodness should extend to all forms of nature, even obscure plants in the Hawaiian rainforest that we may not know or care about prior to developing an ecological understanding of the system.

[58]Rolston, *Environmental Ethics*, 223.

[59]Robert N. Wennberg in *God, Humans and Animals: An Invitation to Enlarge Our Moral Universe* (Grand Rapids, MI: Eerdmans, 2003), argues that because of the special moral status humankind is given within God's creation, this calls for a "serious, even revolutionary, moral concern for animals" (p. 222).

[60]Excerpt from a letter to state legislators from an East Maui partnership of the Nature Conservancy, East Maui Irrigation Co., the National Park Service, and the State Department of Land and Natural Resources, August 27, 1999.

[61]In one unit of the Nature Reserve Area in Hakalau, the pig population was reduced by 90% in eighteen months, with 120 pigs killed in the process. In another unit, it took nine years of hunting with dogs to reduce the population by 90%. This time over 1,000 pigs had to be killed because greater survival meant greater reproduction over time. See *Environment Hawai`i* 8, no. 4 (October 1997), http://64.75.176.15/environment/1199snaring.htm.

[62]Excerpt from *PETA News* 8, no. 2.

[63]For example, Gen. 2:15, gives an all encompassing injunction to care for the garden.

[64]Biblically, humans are given permission to kill animals (e.g., "The fear and dread of you will fall upon all the beasts of the earth and all the birds of the air, upon every creature that moves along the ground, and upon all the fish of the sea; they are given into your hands" [Gen. 9:2]), but this permission is not without restriction. The inherent power of animal sacrifices practiced in biblical times was derived from the sacredness of life, e.g., Gen. 9:4 refers to the fact that the life is in the blood of an animal.

[65]Quoted in Jan TenBruggencate, "Nature Conservancy Ripped Over Traps," *The Honolulu Advertiser*, April 17, 1996.

[66]Robert Devine, *Alien Invasion: America's Battle with Non-Native Animals and Plants* (Washington, DC: National Geographic Society, 1998).

[67]Anonymous, "Snares: Effective but Controversial" *Environment Hawai`i* 8, no. 4 (October 1997) www.environment-hawaii/1097snares.htm.

[68]In many jurisdictions, weed species are prioritized for control or monitoring based on various measures of relative impact. An example of this kind of prioritization for the Hawaiian islands can be seen at the HEAR (Hawaiian Ecosystems at Risk Project) website: www.hear.org/wra/index.html.

[69]Holmes Rolston III, *Conserving Natural Values* (New York: Columbia University Press, 1994), 117.

[70]Ibid., 117.

[71]Ibid., 117.

[72]In *Caring for Creation: Responsible Stewardship of God's Handiwork* (Grand Rapids, MI: Baker, 1998), Calvin DeWitt refers to Jesus Christ as "Creator, Integrator and Reconciler" (p. 16).

[73]Michael Soulé, "The Social Siege of Nature" in *Reinventing Nature: Responses to Postmodern Deconstruction* (Washington, DC: Island Press, 1995), 156.

[74]William Cronon, "The Trouble with Wilderness," in *Uncommon Ground: Toward Reinventing Nature*, ed. William Cronon (New York: W. W. Norton, 1995), 80.

[75]Bouma-Prediger, *For the Beauty of the Earth*, 143.

[76]Van Driesche and Van Driesche, *Nature Out of Place*, 298.

[77]Arthur Medeiros, "The Pu'ole'ole Blows and 'Awa Is Poured; Hawaiian Seedlings Return to Auwahi" *Environment Hawai`i* 10, no. 11 (May 2000) www.environment-hawaii.org/500auwahi.htm.

[78]Paul Gorman, head of the National Religious Partnership, speaking on the video "Keeping the Earth" produced by the Union of Concerned Scientists and by New Wrinkle Inc., with cooperation from the National Religious Partnership (1996).

[79]Even though these creations are admirable in other contexts.

[80]The o'hi'a tree (*Metrosideros polymorpha*) is the most prominent native tree species in Hawaii, and it happens to be a member of the myrtle family.

# Anti-Aging: Radical Longevity, Environmental Impacts, and Christian Theology

*Dorothy Boorse*

*Current biomedical research shows promise for prolonging human life spans. Responses to these possible technologies vary from extreme caution, to exuberance, to a futuristic vision of humanity transforming itself. Bioethicists express concerns about big social and individual costs. Some views are expressed in the rhetoric of a culture war similar to those over cloning, stem cell research, and euthanasia. The possible effect on the environment is unknown. The biggest effect is likely to be on an increase in individual consumption of resources by a few and greater gaps between the rich and the poor. On a number of levels, radical longevity affects our view of self, humans in community, and our role in the natural world. I propose that prolonging human primary life span substantially is not a biblical mandate and is only appropriate when placed in the context of our role as humans and current environmental and social issues.*

**Dorothy Boorse**

*"Our technological abilities have outpaced our moral intuition"*
*—Scholarship applicant, Gordon College 2001.*

In the 1998 novel *The First Immortal*,[1] author James Halperin paints a picture of a future world in which people routinely have themselves frozen cryogenically until the day when scientists have cured cancer and solved degenerative disorders. They can then thaw frozen people, solving their medical problems so they live extremely long, almost immortal lives. Indeed, his protagonists consider this the rational, scientific thing to do and argue that it represents the triumph of science over superstition and religion. While this may seem to be in the realm of science fiction, Halperin suggests that much of the science is, in fact, in its infancy but developing rapidly.

In April 2004 a geriatric dwarf mouse named Yoda died at the age of four years, much older than the two-year life of the average lab mouse. This history-making mouse was estimated to have lived the equivalent of 136 years in human time.[2] This event is just one breakthrough in an effort scientists are making to understand why we age and why our bodies decline. Understanding aging mechanisms may help us to slow or cure age-related diseases or even, some believe, to elongate the natural human life span so that people can live 150 years or longer.[3]

## Science: Why We Age, Life Expectancy and Life Span

*Life expectancy*, the mean likelihood of living for a group, increased dramatically in the twentieth century in developed countries and in many developing countries. These gains have been achieved by preventing and curing disease, resulting in what is called *secondary longevity* as more people survive to the end of the normal human life span through medical interventions. Much of the progress to be made with curing disease has been done on childhood pathogenic diseases. This demographic change (most people living a full life span and dying in old age) is

*Understanding aging mechanisms may help us to slow or cure age-related diseases or even ... to elongate the natural human life span ...*

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*[Dramatic increased] gains [in life expectancy] have been achieved by preventing and curing disease, resulting in* secondary longevity ...

*In contrast,* primary longevity *is an increase in the individual's total life span.*

called *rectangularizing the curve* (Figure 1).[4] Rectangularizing the curve is often accomplished by morbidity and mortality *compression*, that is, the years during which most people become ill and die are fewer and individual periods of illness become shortened.[5]

aging is that there is no compelling reason to maintain the body longer. After reproducing, we cease passing on genes, so unless there is a reproductive fitness advantage to doing so, we will not maintain bodies after they have done the bulk of their reproduction.[8]

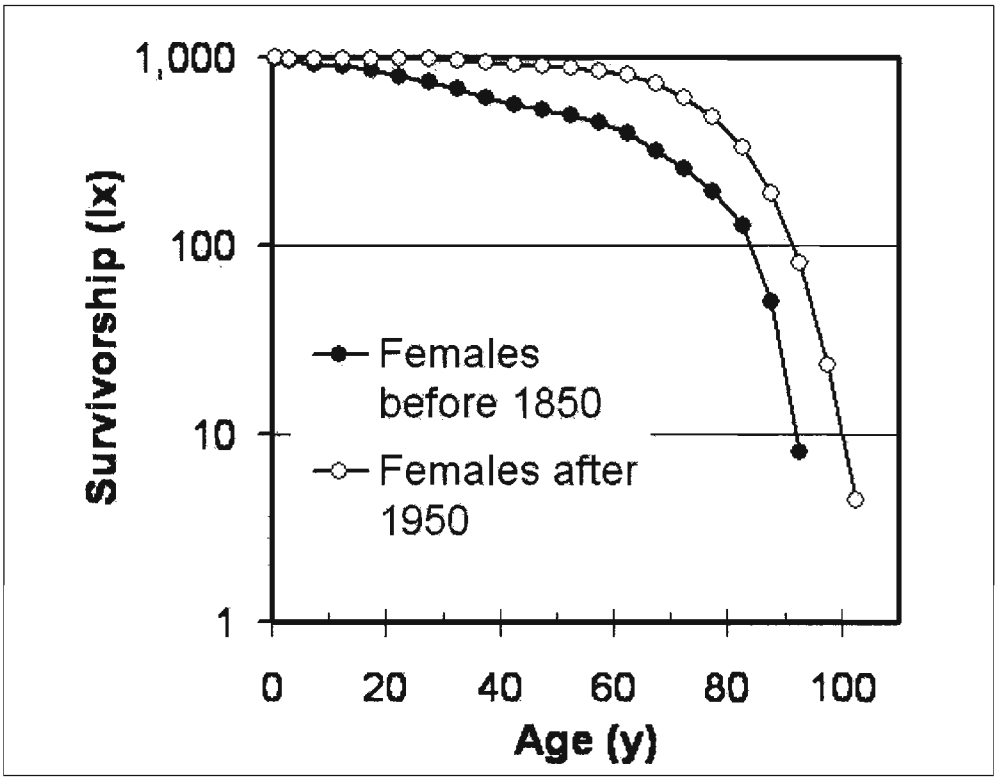


**Figure 1.** Survivorship curve for females buried during two time periods (pre-1850 and post-1950) in graveyards in Ipswich and Hamilton, Essex County, Massachusetts, USA. Rectangularization of the curve occurs as more individuals of the population live close to a maximum life span. The curves for males are similar.

Thus, individually solving problems of aging-related disease such as diabetes, heart disease, and Alzheimer's will increase life expectancy, but only so much, perhaps no more than by fifteen years.[6] This would leave the majority of people who have access to medical care, living into the 90s and many over 100. Some may live as long as 125, similar to the life span of the longest-lived person so far, the French woman Jeanne-Louise Calumet. We are already seeing the impacts of aging in societies like the United States, Europe, and Japan, where elderly Japanese women are the longest-lived group in the world.[7]

In contrast, *primary longevity* is an increase in the individual's total *life span*. To lengthen life span substantially requires addressing the question: "What makes us age?" The simplest scientific explanation for the effects of

Another reason we age is because of the accumulating damage to DNA that occurs over a lifetime.[9] A third aging mechanism is a built-in limit to cell divisions caused by caps on chromosomes called *telomeres*. Each time a cell divides, the telomeres become shorter, until cells can no longer divide.[10] Studies of extremely old individuals suggest there is a genetic component to longevity. Researcher Dr. Thomas Perls has pinpointed a region of human chromosome 4, which seems to be related to longevity.[11] Other research has shown that single mutations in nematodes can produce worms that live more than 50% longer than the normal life span, with fewer of the normal age-related changes.[12]

Current aging research has suggested potential anti-aging (or age retardation) interventions including extreme caloric restric-

tion, genetic manipulation to insert long-life genes, introduction of the telomere-restoring enzyme telomerase, and tissue rejuvenation through stem cell addition. Some of these interventions will address both the mechanisms of aging itself and of age-related diseases.[13] The use of nearly totipotent cells such as embryonic stem cells (ES) opens an array of medical possibilities that might help in the case of paralysis, heart disease, and even restoration of bladder function.[14] However, ES cells, while able to proliferate and to become different types of differentiated cells, still will have the problems of immunological incompatibility with patients. Furthermore, the ethics of using ES cells is a subject of intense cultural debate.[15]

Because circulating levels of several hormones decrease with age, hormonal supplementation may be an anti-aging intervention.[16] However, hormone therapy can produce conflicting results. Human growth hormone (hGH) levels decrease with age and some replacement therapies reverse muscle loss associated with aging, but genetically manipulated animal models with exceptionally long lives either have less growth hormone or have fewer receptors for it.[17] In spite of possible mixed effects of its use, there are at least 250,000 web sites that sell human growth hormone, many claiming it as an anti-aging remedy.[18] By 2001, at least 10,000 people were regularly taking human growth hormone to offset the effects of aging.[19] Some people are touting testosterone supplementation for men as an aging remedy. In 2002, two million prescriptions for supplemental testosterone were filled in the US.[20]

## Three Views

There is little consensus about whether substantial primary life span increases are possible, and about the ultimate goals of such efforts. Radical longevity raises huge questions about what it is to be a person, to be in community with nature, each other, and God. Discussions on these issues are beginning to take on the rhetoric of a culture war, similar to the deep cultural divides we experience in the United States over the issues of abortion, euthanasia, genetically modified crops, and the death penalty. Three groups are:

1. The very cautious: Some people believe no substantial increases in *primary longevity* are possible, or believe that such an effort is misguided if it is possible. There is variability in this group in level of concern and problems they identify. Garrett Hardin and Daniel Callahan have each said that efforts to increase *primary longevity* are morally wrong because of potential impacts on population size and distributive justice.[21] In contrast, Leon Kass of the President's Council on Bioethics is concerned about basic changes to human roles in the universe. He fears that the drive for longevity leads logically to a push for biological immortality.[22] Demographer S. Jay Olshansky is primarily concerned because he believes that an increase in *primary* longevity is very unlikely and that elderly people are prey to quackery.[23]

2. The exuberant middle: In contrast, many biomedical researchers believe substantial life span extensions can and will be made in the future.[24] Researchers Cynthia Kenyon and Leonard Guarente have joined together to form a company, Elixer Pharmaceuticals, with the hope of producing a medication that controls the insulin-like hormonal pathways that affect aging. Other age-retardation research companies are emerging. However, researchers in this group are not attempting to promote life spans longer than a few hundred years and discredit any attempt to claim they could be longer.[25] They are seeking the "fountain of aging well, rather than the fountain of youth."[26]

3. The futurists: These anticipate a time when, if a part of our bodies is not working, we can fix it. Death will be only due to rare accidents or crimes.[27] Molecular biologist Aubrey de Grey of Oxford University, for example, believes that by 2030 we will have cell loss licked, and human life span will be 130 years, and that by 2100 some people will have life spans of four to five thousand years, eventually leading to indefinite life expectancy.[28] In addition to researchers, there is a large societal segment that believes that biological immortality is possible, and even that its pursuit is our moral responsibility.[29] This is reflected in the following from the founder of a futuristic company:

> Non-aging biological immortality is the technology that will allow human beings to live physically and consciously forever with growing prosperity and happiness. That is man's *highest moral goal* ... such biological immortality is not only possible but becomes a *mandatory moral obligation* through man's self-invented consciousness[30] (Italics added).

## Effects of Different Views of Humanness

How can members of the same society have such different views? First, they use different cost/benefit analyses of the consequences of super-longevity. Second, they differ in basic beliefs about humanity's purpose on earth, the role of death, and the basis for ethical decision-making.[31] Many of these differing views are themselves based on concepts about humans in community.

In general, those who are very positive about substantial increases in life span emphasize individual benefits and a combination of extremely immediate benefits ("I would like to live a little longer") and very remote benefits ("Hundreds of years from now there will be no sickness"). But they de-emphasize the social impacts or the medium term impacts ("Is this a good idea in fifty years?"). They believe strongly in modern individualism[32] and are less convinced that humans need to be concerned about the good of all. One says, for example, "Well, we do not normally suppress goods and services because they may be disproportionately available to the rich. The whole point of legitimately acquiring wealth is that it becomes possible

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to buy things that are unavailable without it."[33] They also may perceive that the benefit to the very wealthy now will help the poor of the distant future, much as medical breakthroughs in the past have.

At this point, all of the anti-aging technologies we can envision are still in the future and some have serious obstacles to be overcome before they can be implemented.[34] Genuine gerontologists are strident in their calls for regulation of anti-aging quackery.[35] If radical longevity is unattainable, the costs to pursuing it include potentially higher taxes, waste of personal income, opportunity costs from not doing something else, and exposure to harmful remedies. However, if it is possible to achieve significant increases in human life span, the most striking benefit is that individual desire to live longer would be met.

For millennia, people have searched for ways to prolong their lives. People might be able to have more careers, more volunteer time, or know more of their relatives, both younger and older. Much as vaccines and antibiotics were in the last century, anti-aging technologies could be seen as a breakthrough that lowers human suffering. Direct anti-aging research is likely to yield results that help with specific age-related diseases and vice versa. If people live longer in greater health and spend less time infirm, anti-aging technologies could improve the economy and allow people longer economically productive periods.[36] Certainly many people want to live longer and want their loved ones to live longer.

In contrast, those who are very cautious de-emphasize immediate individual goals and emphasize intermediate social costs and long-term, meaning-of-life issues. Numerous authors have reviewed the individual and social costs of extreme life span extension.[37] One of the big causes of uncertainty is whether the extra years would be healthy ones. This depends on whether life span is simply stretched out, illness is compressed, or there are long periods of slow decline. Obviously the costs are greater if the decline at life's end is slow. Additionally, some non-age-related illnesses are on the increase, even in developed countries.[38] This means that some people could live longer periods of time with endocrine, autoimmune, or mental disorders that would not obviously be solved by research that prolongs life span. Other costs of radical longevity will compound costs we already see in societies with increasing numbers of elderly.

Consequently, statements such as de Grey's proclaim, "I'm saying that by 2030 we will have the technology to get them to live to about 130. And those extra years will be healthy years. That's very important not to forget—that this will not be an extension of a frail life,"[39] may be too simplistic. Others predict that the future super-old could be more fragile than the centenarians of today. "You'll be seeing many, many more extremely frail and disabled elderly individuals who wouldn't have made it out to these ages if it hadn't been for medical technology," says S. J. Olshansky of the University of Chicago.[40]

Concerns of the cautious for social community are numerous. One of the most likely results is the increase in the percentage of GDP that must be spent on health care because of repeated tests and medical interventions.[41] Most likely, there will be a profusion of hormone, stem cell, gene therapy, and medical chemicals applied to the task of repairing aging bodies.[42] An increase in the gap between the haves and have-nots will most likely occur as it has with other recent technological advances. Power may remain longer in the hands of a few, possibly including tyrants. Most of the world will not have access to anti-aging technologies.[43] If such technologies are available, they will be expensive and proportions of income spent on health care by individuals may increase. This effect would harm those who are just able to afford a new technology more than those people who can readily afford it.[44] A shift in spending on health care is already occurring in countries with dramatically aging populations. In countries like the United States, spending on the elderly dominates the budget. In countries that lack health care for the elderly, elderly people may be caught in a bind if they have sufficient money to prolong their lives, but not to live them well. There may be generational equity problems that arise as resources go to the old at the expense of the young.[45]

Social costs also include longer term incarceration of criminals, longer care of people who have non-age related disabili-

ties,[46] more competition between old and young for jobs, potential health problems in future generations, and a continuation of the issues that already face aging populations.[47] Relative to the total number of people, there will be fewer children in society, and the period of time in a person's life during which they raise children will be relatively short.[48] This might easily drive a desire for genetic enhancement of children or a backlash against children with unwanted traits.[49] In the extreme situation of biological immortality, there would be almost no children. Hardin estimated that if people die of accidents at rates similar to current rates but not from disease or aging, rates of birth would have to be 5 to 10,000 per year. "Birth in a society of immortals would be so rare as to justify selling tickets to witness the event."[50] Other consequences could include waiting long periods for workplace promotion, and mental illness increase or memory loss from too many life events. People may become set in their ways.[51]

Some of the social changes are also changes to individuals as the meaning of personhood is altered, either for good or bad. People who are actively pursuing a lifelong effort to alter their bodies and maintain a younger state may idolize youth even more than is currently the case, ironically devaluing maturity.[52] Because elderly women are more likely to be poor and thus lack access to costly anti-aging interventions, some feminists believe pursuing longevity will exacerbate social ills that result in the worship of youth and the marginalization of those naturally aging.[53] An increased gap between the rich and the poor may also destabilize parts of the world, cause high immigration pressures, and make it even more difficult for emerging economies to protect their environments, provide for their people, and pull down their population growth rates.[54]

Some people believe we would not be any more content with our lives than we are now. They point out that when incomes rise, contentment rises briefly and then returns to a lower level. If life span is like money, living longer will not make people feel happier.[55] In fact, some people may not choose to live out their whole lives. Obviously, the impact of these consequences depends on how successful the technologies are, how available they are, and how extreme the life span extension is.

## Environmental Problems: A Black Box

While bioethicists are debating whether longevity extension is good individually and socially, the impact of increased longevity on the environment is a real unknown in the equation. As humans, we are part of nature and in relationship with the rest of the created world. This essential connection between the natural world and us is part of our nature as persons made in the image of God. These concepts are worked out in numerous places in the Christian environmental literature.[56] John Wood, for example, explains that loving creation is fundamental to our nature as humans because of our relationship to God.[57]

Thus, the environmental impact of radical longevity is an important part of the puzzle as we determine the ethics of such a goal. Part of the answer depends on the types of interventions used. Direct impacts would be similar to the environmental impacts of current medical technologies deployed over a longer period of time. With new technologies, we may have other environmental hazards, such as human genes getting into other organisms or increased antibiotic resistance. Finally, just as we see with quack remedies, environmental harms occur from the overcollecting of natural products for health care, such as shark cartilage, sea corals, or yew trees, which have accompanied previous scientific breakthroughs.[58]

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Most environmental impacts, however, are unlikely to be directly from the life span extension technologies. The biggest effects will come indirectly from changes in population growth rates and resource consumption patterns.[59] Currently medium projections show population growth continuing to be above replacement level in the Third World until well into the century, possibly leveling off between 2050 and 2070. Lutz, et al. estimate the probability that population growth will end by 2100 at 85% and the probability that world population will peak fewer than ten billion at 60%.[60] Medium United Nations projections are around eight billion people, with some projections substantially higher. Population aging trends even *without* increases in human life span will leave parts of the world with close to half of the population over the age of 60, an extreme that will be unique in human history.[61]

The impact of longevity on population growth depends on how feasible it is to make substantial increases in life span (both *primary* and *secondary longevity*) and how available those increases are to large numbers of people. Both questions are hotly debated. Using current patterns of disease prevention but without new genetic therapies, it is unlikely that life expectancies will increase even to one hun-

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dred years.[62] If headway is not made to slow the effects of aging itself, disease morbidity could be compressed into the last years of life and may result in diminishing returns for health care spending. This would result, however, in people experiencing a greater proportion of healthy years.[63] What extreme futurists propose, however, is to dramatically increase life span (*primary longevity*) by slowing aging itself. If this were the case, population could rise more rapidly than projected due to an increased gap between fertility and mortality rates as populations did in the twentieth century with vaccination.[64]

Because anti-aging remedies are not currently available, and are unlikely to be available in the Third World where most population growth is occurring, it seems unlikely there would be a dramatic increase in final population size. Indeed, such an increase could be offset in some parts of the world by the currently high rates of HIV infection, particularly in Africa. In Zimbabwe, for example, life expectancies have fallen from a mean of 65 years to 39.[65] Even if everyone had access to anti-aging technologies, and mortality from AIDS was lowered, the increase in life span from increase in *primary longevity* has much less effect on population growth than one might expect. The extra years added are at the end of the life span and are unlikely to increase reproduction.[66] This is particularly true if the life cycle is "stretched" so that reproduction occurs later and if population growth rates are already at replacement level.[67]

However, since population growth is currently substantial, any increase in life span will cause some increase in population before population stabilizes. Arguably, population growth is on the very edge of what we will be able to accommodate, and growth rates in some parts of the world do not seem close to stabilization. Niger, for example, with the world's highest birth rate, has recently seen a rise in fertility to a mean of eight children per woman.[68] Because water is the limiting factor for much agriculture in the world and limited potable water is a crisis in much of the developing world, our difficulties in producing current levels of food will increase. Thus, any additional increase in population is worrisome. In a meta-analysis of sixty-nine published estimates of human population limits, Van der Bergh and Reitfeld found a central tendency to 7.7 billion people in a sustainable population reached around 2050.[69] Notably, many estimates of the likely peak human population are higher than their estimated sustainable human population limit. This puts into sharp relief blithe comments that biotechnology will be able to feed eight billion people in the twenty-first century. In any case, the rise of population in the past two centuries and the anticipated rise by another 50% in the next fifty years will place maximum stress on our resources. Taking actions that increase longevity will increase this stress, bringing harm to people and to the environment.

In the case of dramatic *primary longevity* increase, natural resource consumption patterns are likely to change. Populations comprised of small households use more resources than same sized populations with larger households (often with more children).[70] Thus the same increase in population numbers due to decreased mortality of the old might have a greater impact on resource use than higher fertility would because older people are more likely to maintain separate households. Lui, et al. estimate that "reduction in average household size alone will add a projected 233 million additional households to hotspot countries (areas of high biodiversity) during the period 2000–2015."[71] Those likely to live substantially longer live in the countries with the highest rates of natural resource consumption and will have a disproportionate impact on resource use.

In summary, the clearest effects of superlongevity increase would be individual and social. However, the environment will also be affected directly by medical technologies and indirectly via slight (but possibly critical) population growth increases, and possibly more significant changes in consumption patterns, including increased resource consumption by the already wealthy.

## Theology: Christian Views on Aging and Death and Anti-Aging

Christians are facing a world of extremely rapid change. Stories of biblical patriarchs living hundreds of years suggest a picture of extremely long life as ultimately desirable.

Would it not be like going back and living the way God wanted the world to be? In the novel *The First Immortal*, Halperin has his characters come to a state of happiness in a biological immortality achieved by repeated efforts to repair ravages of age. The characters believe this is good. One, a Roman Catholic priest, concludes that this is God's will and an expression of a pro-life stance, equivalent to following Jesus' resurrection from the dead. Some real life Christians and Jews agree, at least to the value of extreme extensions of life. Jewish theologian Rabbi Neil Gillman said on a bioethics panel, "There is nothing redemptive about death. Death is incoherent. Death is absurd." He concluded that in Judaism, the indefinite prolongation of life is a moral good.[72]

Here we have seen that views on radical longevity differ widely, in part because of different assumptions about the achievability of that goal and in part because of different concerns about the other potential costs and benefits of doing so. I propose we evaluate the basis and effects of radical longevity in light of what Christians believe about the nature of being human and in community with others, nature, and God. These relationships are covenantal and embedded in space and time.[73]

I suggest that the goal of biological immortality or indefinite human life span is not in agreement with Christian belief. Further, I contend that, because we live in relationship, the goal of radical life span extension short of indefinite human life span (that is, hundreds to thousands of years) is currently inappropriate because it conflicts with other, more important goals. The goal of achieving indefinite human life spans can replace the goals that Christianity espouses as the chief ends of humans: "To love God and enjoy him forever" and "To glorify God."[74] These goals stem from a subordinate position of humans to God and are dependent on our acceptance of dependence and our role as creatures rather than creator. Two of the characteristics Christians attribute to humans are finitude and relationality.[75] Recognizing our finitude morally and physically can bring us to repentance for sin, and enables us to have the virtues of greater humility and dependence on God.[76] Thus we are limited by the very nature of being human.

Bioethicist Leon Kass asserts that "to argue that human life would be better without death is, I submit, to argue that human life would be better being something other than human."[77] This is one reason why, in many bioethics discussions, theologians are concerned about "playing God." The very nature of our short lives "as grass" highlights God's eternal nature and glorifies him. To try to be unlimited via human efforts is to fall into the sin of the builders of the Tower of Babel or later of King Nebuchadnezzar and is morally wrong.[78] While some Christians view death as the ultimate evil,[79] it is clear that such death is spiritual rather than physical, because Paul views physical death positively, saying, "For to me to live is Christ and to die is gain" (Phil. 1:21).

However, the belief that mortality is a fundamental and necessary part of human experience is not universal. Declaring that nanotechnology can be used to promote biological immortality and if it is possible to do so, we are morally obligated to do so, Robert Freitas writes: "Even the most widely recognized greatest disasters in human history pale in comparison to natural death." He believes that we should be pouring resources into anti-aging research even if it causes overpopulation in some parts of the world because the death of people by natural causes is an evil we cannot accept.[80]

In contrast, St. Francis of Assisi had no doubts about the goodness of death. From the final verse of his prayer, "Canticle to Brother Sun," he expresses the value of death:

> All praise be yours, my Lord, through Sister Death,
> From whose embrace no mortal can escape.
> Woe to those who die in mortal sin!
> Happy those She finds doing your will!
> The second death can do no harm to them.
> Praise and bless my Lord, and give him thanks,
> And serve him with great humility.[81]

Not all people who are promoting radical longevity claim to be attempting to conquer death entirely. Those in the exuberant middle simply want a great deal more life. In an essay on the biotech revolution, David Gushee challenges fellow Christians: "Tell us why we should not proceed to remake humanity now that we are developing the power to do so."[82] And Charles Harper of the Templeton Foundation says: "I favor radical life extension ... So I say hooray for life and hooray for more of it."[83] I would answer we should not remake humanity, at least not in this way. Not because it is clearly wrong, but because the direct mandates we have from God promote a vision of the world in which prolonging our own individual lives substantially is not a priority, at least not one to be promoted over caring for our neighbors and caring for creation.

In our relationships with others, our concerns might include closing the gaps between rich and poor and healing the sick.[84] However, caring for the sick is not necessarily the same as promoting a much longer life span. Pouring efforts into doing so for ourselves, or even for others, is an effort that could exacerbate other social ills described above. Thus our efforts need to address all social issues before promoting one extreme for a few. This includes caring for future generations.

Hardin comments on the individualistic nature of longevity promotion. He says:

> Thus far the approach to death has been principally oriented by the interests of the individual. This is in keeping with the temper of our time, which is predominately individualistic. Unless the matter is called

# Article

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> to our attention, we unthinkingly assume that whatever benefits the individual benefits the group ... An act is generally identified as compassionate if it diminishes suffering right now: we seldom demand of a compassionate act that it diminish suffering a decade from now.[85]

As people in relationship with others, we need to solve the problems of overpopulation, distributional injustice, and loss of community before striving for increases in *primary longevity*. The temptation of modernity is to live as individuals disconnected from each other and from nature.[86] Pursuit of radical longevity, including biological immortality, is the apical vision of the independent individual but it could also be construed as a positive, exciting plunge into technology that would alleviate enormous human suffering. How can we decide which way to view it?

To balance these, I believe we should promote anti-aging technologies which increase *secondary longevity* but which do not necessarily increase *primary longevity* until our priorities of living out a better vision of our current life span are in effect. Perhaps in the future, such technologies will be more appropriate. Loving our neighbor and caring for the world are tasks God has given us and finitude and relationality are part of the nature he has given us. As we recognize these truths, we can promote a community of mortals, awaiting Christ's return, and seeking as well as possible, justice, mercy and humility and all of the virtues flowing from them, until we die and become truly immortal. ✦

*I believe we should promote anti-aging technologies which increase secondary longevity but which do not necessarily increase primary longevity until our priorities of living out a better vision of our current life span are in effect.*


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## Notes

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[78]C. B. Mitchell, "The Quest for Immortality," *Aging, Death and the Quest for Immortality*" (Grand Rapids, MI: Eerdmans, 2003), 153–63. Differences between eternal life in Christian theology and biological immortality are described by D. Allen, "Epilogue: Extended Life, Eternal Life," in *The Fountain of Youth*, ed. S. Post and R. Binstock (Oxford: Oxford University Press, 2004), 387–97. Also, limitation as part of our createdness and sin of pride and overreaching includes Satan tempting Eve and Adam (Gen. 2), Tower of Babel (Gen. 11), and Nebuchadnezzar (Dan. 4:33).

[79]Death as a natural limit. Either God created a mortal creation with every intent of allowing disease and predation to control populations and with eventual physical death as the norm, or his intention was for humans at least, to live indefinitely in earthly bodies and disease and physical death result from the fall. I believe the first view is best supported by Scripture and is upheld by centrist historic Christianity. The healing ministry of Jesus, the verse "the sting of Death is sin" and the conquering of Death as the final victory, suggest that disease and death are bad, and not God's plan. However, in his essay, "A Christian Ecology of Death: Biblical Imagery and the Ecologic Crisis" (*Christian Scholars Review* 4 (1975) :319–29), Loren Wilkinson tries to reconcile the reality of God's creation of a world dependent on death for nutrient cycling. He says:

> But there is another, seldom recognized element in Christian thought which has contributed much to western man's failure to think in terms of the ecosystem: that is, the teaching that death is evil, and the result of sin. Such a teaching makes it particularly hard for a Christian to see the world as ultimately good. The various food chains which keep the world ecosystem in trim are all forged by death. Not only does food depend upon death, but death and decay are essential clocks on the exponential growth of unmolested life. Genesis suggests that this fecundity is God-given. To all life God declares "Be fruitful and multiply." ... It is both fecundity and voraciousness which keeps our planet whole. Organisms eat in order to live, and in turn are eaten. For we are not reconciled to death. We are not prepared to see it as a part of the created order. The normal Christian reading of scripture sees death as the result of sin: death is the promised result of human disobedience, and human disobedience results not only from human death, but in the ultimate deaths of all things. Delivery from sin is equated with delivery from death. Presumably, when there is no more sin on earth, there will be no more death. But he ecologist hastens to add, there will be no more life either.

[80]Freitas, "Death is an Outrage."

[81]St. Francis of Assissi, *The Franciscan Archive* (1224): www.franciscan-archive.org/patriarcha/opera/canticle.html (Accessed June 2004).

[82]D. Gushee, "A Matter of Life and Death: The Biotech Revolution." However, because there is a strong biblical principle in favor of life and healing, I do not believe that opposing extreme life span increase logically suggests we should extrapolate that it would be good to *shorten* our lives in order to serve the other principles.

[83]Bailey, "Vulgarity and Tastelessness."

[84]Many biblical texts refer to healing as a blessing, as a command, or as central to the life of Christ including: Ezek. 34:3–5; Matt. 4:22–24, 8:16, 9:34, 12:15; Mark 6:13, 56; Acts 3:1–10, 5:28.

[85]Hardin, *Promethean Ethics*.

[86]Gunton, *The One, the Three and the Many*.

# Book Reviews

## ENVIRONMENT

**CHRISTIAN ENVIRONMENTAL ETHICS: A Case Method Approach** by James B. Martin-Schramm and Robert L. Stivers. Maryknoll, NY: Orbis Books, 2003. 325 pages. Paperback; $20.00. ISBN: 1570754993.

Martin-Schramm, associate professor of religion at Luther College, has served on the presidential Council on Sustainable Development. Stivers, professor of religion at Pacific Lutheran University, is coauthor of *Christian Ethics: A Case Study Approach*.

The publisher of this book, Orbis Books, seeks to publish works that enlighten the mind, nourish the spirit, and challenge the conscience. Orbis Books is the publishing arm of Maryknoll Fathers and Brothers. *Christian Environmental Ethics* is published under the Ecology and Justice Series banner, seeking to integrate an understanding of the Earth as an interconnected life system.

*Christian Environmental Ethics* contains twelve chapters divided into two parts: (1) foundations for ethical reflections; and (2) cases and commentaries. Each chapter concludes with notes, a list of further readings, and a list of web sites. Most of the book is dedicated to nine case studies on such critical topics as urban sprawl, habitat fragmentation, endangered species, nuclear waste, and genetic engineering. Specific problem locations are identified such as the 3,000 foot peak in Washington called Market Mountain, Snake River in Idaho and Washington, and Skull Valley in Utah.

Not only are problems discussed but solutions are suggested. Take, for example, the issue of environmental degradation. The authors suggest environmental degradation has five causes, the first two being too many people some of whom consume too much. The world's human population is more than six billion and increases 1.3% yearly. Birth rates in rich countries are roughly equal to death rates. In poor countries, while birth rates are going down, they still exceed death rates. Africa's population grows 3% a year. The United Nations projects human population to reach nine billion by 2050 before it stabilizes.

What is the solution to the problem of environmental degradation? "Social development projects backed by appropriate environmental and population policies, adequate financing, land reform, and local control have been successful in lowering birth rates and reducing the degradation of ecosystems" (p. 11). In discussing these topics, the authors think "Christians can draw on various aspects of their tradition as they grapple with ethical issues related to these topics" (p. 175).

The book has received praise as "a real treasure," "ethics done well," and "teaching at its best." At the end of the book, in addition to an index, is an appendix on resources for teaching. This feature makes *Christian Environmental Ethics* an appropriate choice for use in a discussion group. A college or adult Sunday School teacher might profitably use it in a class. Its case studies and personal references keep it from being too erudite and pedantic. Christians can become much better informed about the environmental crisis by reading *Christian Environmental Ethics*. I recommend it.

*Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.*

## FAITH & SCIENCE

**SCIENCE AND CHRISTIANITY: Conflict or Coherence?** by Henry F. Schaefer. Watkinsville, GA: The Apollos Trust, 2003. 179 pages, appendix, and index. ISBN: 097429750X.

Schaefer is a professor of chemistry at the University of Georgia, and this is his first book. It is a compilation of some speeches he has given on apologetics over the past twenty years. In the preface, Schaefer notes that this is both good and bad. Most of the egregious errors have been removed over the years, but the references documenting the points are lacking.

The book has ten chapters covering areas like Scientists and their Gods, The Nondebate with Steven Weinberg, The Big Bang, Climbing Mount Improbable, Quantum Mechanics and Postmodernism, C. S. Lewis on Science and Scientism, Ten Questions Intellectuals Ask, his testimony, and what he calls "The Way of Discovery." Each is a self-contained essay, and they are all fairly basic and fairly nonphilosophical.

In the chapter Scientists and their Gods, Schaefer answers the question whether it is possible to be a scientist and a Christian. For most readers here, this will be a strange question akin to asking if it is possible to be a thief and a Christian. Schaefer answers in the positive citing several atheists, like Feynman, that it is OK to be a Christian and a scientist. He then notes that science developed in a Christian environment citing many of the early scientists as Christian (Kepler, Newton, Boyle, Pascal, etc.). But the problem with this approach is that one has to go back a few centuries to find Christianity at the forefront of the scientific world, and in some sense whether William Perkins was a Christian seems not to matter much to the issues we face today reconciling our faith with observation.

From a personal perspective, The Nondebate with Steven Weinberg was interesting as Schaefer cited my web account of that "debate." Schaefer claims that Weinberg equated Mohammed, Jesus, and Buddha and "called the three religious leaders 'fairies.'" The tape I have of the debate shows that he did not name Mohammed or Buddha but named Zeus, Jehovah, Christ, and Allah. Wienberg used the term as a placeholder for any supernatural being. Schaefer also claimed that Weinberg almost broke down when he said that people would not see their families after death, but others there recall the statement but do not recall the near breakdown.

The chapter on the Big Bang discusses the anthropic principle and the chapter on Dawkins presents the usual

arguments against the origin of life. There is little which is novel in these chapters. Schaefer's idea of what is in the geological record and its order is vastly different. When outlining his conformance between the Scripture and earth history, he has land plants arise before marine life. This is, of course, backwards. He also claims that Day 4 was a clearing of the atmosphere, an event for which there is absolutely no evidence. And flying creatures do not arise before land animals, contra this book.

The Ten Questions chapter actually presents twenty-one questions which are all rather basic, "Who made God?" "Who is Jesus?" "What about other religions?" etc. The questions are answered with simple answers. One gets the feel that the responses are superficial.

The lack of philosophical depth to the book is best illustrated by Schaefer's surprise that the question "Can God make a rock so big that he can't lift it?" was not a joke. That is one of the biggest weaknesses of the book. The book gives the impression that there has been no deep wrestling with the issues confronting theology today. That is too bad as Schaeffer obviously has made important contributions to quantum chemistry.

There are very few references throughout the book and indeed the book seems to have been little altered from the lecture notes. While that will be a good documentation of his lectures, it is unlikely to make much of a mark on the intellectual tenor of our times.

*Reviewed by Glenn Morton, 10131 Cairn Meadows Dr., Spring, TX 77379.*

## HEALTH AND MEDICINE

**THE HEALING CONNECTION: The Story of a Physician's Search for the Link between Faith and Health** by Harold G. Koenig. Philadelphia, PA: Templeton Foundation Press, 2004. 204 pages. Paperback; $14.95. ISBN: 1932031650.

Koenig is the director of the Duke University Center for the Study of Religion/Spirituality and Health, and editor of *Science and Theology News*. He has authored dozens of books and journal articles about the relationship between faith and health. Templeton Foundation Press, the publisher of this book, promotes knowledge about invisible and intangible reality including such spiritual aspects as love, creativity, worship, and purpose.

Koenig's interest in faith and health has been influenced by his life's personal experiences, contact with patients, and his study of research outcomes. He learned that in times of physical and emotional turmoil, people turn to religion for help. Many of them find it helps lessen depression, anxiety, and physical symptoms.

Koenig is careful to point out that benefits flowing from religious belief do not prove God's existence. Furthermore, religious faith does not guarantee good health and long life. But Koenig does conclude that both individuals and churches might consider how physical and mental well-being can be improved by religious faith and action.

*Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.*

## HISTORY OF SCIENCE

**LIVING ENERGIES** by Callum Coats. Gateway (www.gillmacmillan.ie), 2001, 311 pages, Paperback; $19.95. ISBN: 0946551979.

The back cover introduces author Coats as a "scientist and architect" who has spent twenty-three years translating and editing the works of Austrian forester and inventor Viktor Schauberger (1885–1958). The book begins with a biography of Schauberger's life, involving his son Walter, in his largely frustrated efforts to either commercialize his inventions or convince the scientific community of his theories about energy, motion, the sun, fluid mechanics, water, agriculture, and atomic theory.

I could only read half way through the book; the rest was skimmed. My motivation to continue was depleted by the many high-school-level errors in physics, reasoning, unconventional and abstruse use of scientific terminology, vagueness, and failure to cite and confront conflicting work. Schauberger was opposed to the more established science, technology, and theology he encountered.

The work amalgamates pseudoscience, the occult philosophy of Helena Blavatsky, and ecological concerns into a profoundly incoherent manifestation of why the scientific and Christian communities reject the genre of literature of which this book serves as an excellent example. A particular instance of the book's content: Schauberger's explicitly neo-pagan views about water appear in the chapter, "The Nature of Water." To Schauberger, water is

> the "original" substance called into being through the "original" motion of the Earth, itself the manifestation of even more sublime forces. Being the offspring or the "First Born" of these energies, as he put it, he maintained and frequently asserted that *"Water is a living substance!"* (p. 107, original emphasis).

This view is combined with the homeopathic claim that substances in water leave a memory, though the molecules of these substances are completely removed from it. Schauberger, in regarding water as alive, rates its quality based on its source and history. He is also fascinated by fluid phenomena, especially vortices. He is concerned that hydroelectric dams damage water, "hurled against steel turbine blades, where it is smashed to smithereens. The physical structure of the water is literally demolished and all the dissolved oxygen, and even some of the oxygen in the water molecule itself, is centrifuged out of the water."

While some of Schauberger's patented inventions might contain new ideas, this book is of value only in illustrating a growing body of literature read by the general public which hides, confuses, and misleads the reader regarding the true nature of physical reality and its relationship to spiritual reality.

*Reviewed by Dennis L. Feucht, Cayo, Belize.*

Richard Ruble, book review editor, has a new email address:

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Please update your address book.

## NATURAL SCIENCES

**RATIONAL MYSTICISM: Dispatches from the Border between Science and Spirituality** by John Horgan. New York: Houghton Mifflin Company, 2003. 292 pages. Hardcover; $25.00. ISBN: 0618060278.

In *Rational Mysticism*, Horgan examines how science, theology, and philosophy deal with spiritual enlightenment and mysticism. In his quest for understanding, he interviewed, among others, theologian Andrew Newberg, transcendental psychologist and Buddhist Ken Wilber, psychedelic pharmacologist Alexander Shulgin, psychologist Susan Blakemore, and shaman Terence McKenna. Horgan is interested in how mysticism is dealt with by neurology, anthropology, physics, and other scientific enterprises.

Here are some of the questions Horgan considers: (1) What neurological links exist between mysticism and madness? (2) If heaven is the ultimate, why did God create anything else? (3) Were Paul's spiritual experiences caused by epilepsy? (4) Do yoga and prayer affect the brain similarly? and (5) Is all mysticism chemically based?

Horgan identifies himself as a "lapsed Catholic," but he seeks to be objective, fair, and candid in his appraisals. His experience as a science writer left him too skeptical to believe in revelations (p. 14); Horgan is not a biblical believer. Nevertheless, he thinks some people who think they are too rational to believe in Christianity have faith that scientific progress is unending. He disagrees. He thinks the important questions will always go unanswered in this life: "Science will never give us The Answer, a theory powerful enough to dispel all mystery from the universe forever" (p. 4). Christians might agree that many questions are unanswerable now; they would also affirm that someday "we shall know" (1 Cor. 13:12).

In his *New York Times* review of this book, Dick Teresi observes that mystic believers write about spiritual enlightenment with "gooey prose" whereas skeptics write about it with "adolescent bitchiness." Horgan walks a fine line between these two extremes seeking to affirm what is empirically believable while raising a skeptical eyebrow over undocumented claims. This means that the enlightened may find this book a tad critical while the "mystical eunuch" (to quote Teresi) will continue to search for answers.

Horgan critiques each position. To give two examples: (1) Horgan finds Huston Smith's Perennial Philosophy, which sees good in all religions, deficient because religions contradict each other in certain vital ways; and (2) He sees postmodernism, which holds truth to be inexpressible, inadequate because it is "a conversation about the unspeakable" (p. 37), "hostile to any kind of belief" (p. 40).

Horgan authored *The Undiscovered Mind* and *The End of Science* (it sold 200,000 copies and irritated some scientists). He was a senior writer for *Scientific American* and has been published in leading newspapers and other publications. Now he is a free-lance writer living in New York's Hudson Valley.

*Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.*

**EARTH'S ECHO: Sacred Encounters with Nature** by Robert M. Hamma. Notre Dame, IN: Ave Maria Press & Sorin Books, 2002. 190 pages. Paperback; $12.95. ISBN: 1893732460.

God has revealed himself in Scripture and in nature. In *Earth's Echo*, Hamma writes of how to find God in nature. He displays his thoughts in six chapter divisions based on geography: nature, shore, forest, desert, river, and mountain. Contributors via quotes include Bill Bryson, of *A Walk in the Woods* fame, Rachel Carson, best known for her *Silent Spring*, and Charles Frazier, author of *Cold Mountain*. Henry David Thoreau and Walt Whitman are also noted.

Hamma finds nature, in all its manifestations, a rich and enduring fountain of spirituality. His appreciation for nature goes back to the summer nights of his boyhood when he gazed at the starry sky and listened to the chirping of the katydids. Now Hamma sees in nature the presence and action of God. To Hamma, God is in the song of the cardinal, the embrace of a loved one, and the exhilarating plunge in the sea.

Hamma believes we are assisted in exploring the wonders of nature by reading the observations expressed by others: "Their writings are sacred because their subject, the earth, is sacred" (p. 22). In reading the words of others, Hamma recommends that we (1) pay attention at a higher level, (2) ponder thoughts of our own, (3) respond to God, and (4) surrender our hearts to the One who has called us. As Hamma proceeds through his geographical divisions, his quotes fall under each of these four headings.

Some readers may find this book tending toward pantheism since there is such an emphasis upon the oneness of God and nature. The writers who are quoted come from a variety of religious traditions. Nevertheless, the author, a graduate of the University of Notre Dame, quotes some from the Bible. This book will indeed call forth quite a bit of pondering about creation and the God of creation. Its insights can elicit awe and surrender and be a helpful devotional accessory.

*Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.*

## ORIGINS & COSMOLOGY

**THE DESIGN REVOLUTION: Answering the Toughest Questions about Intelligent Design** by William A. Dembski. Downers Grove, IL: InterVarsity Press, 2004. 334 pages, index. Paperback; $22.00. ISBN: 0830823751.

Dembski has previously published *The Design Inference*, *Intelligent Design*, and *No Free Lunch*. This book should not be ignored or treated with indifference. It should be required reading for all ASA members! If Dembski is wrong, he needs to be answered (especially as he is critical of the position taken by ASA members at several points); if right, then his views will ultimately change the nature of the ASA, and maybe even the scientific establishment.

Dembski has a razor-sharp mind and meets the challenges of Darwinism with clarity, precision, and critical sense; leaving the reader with the conviction that they

have received honest, satisfying, and definitive answers to the toughest questions. The book is divided into forty-four chapters, each devoted to a different issue. There is inevitable overlap, but never a sense of needless repetition. The chapters are grouped into six parts, each with an overriding theme.

Part One (Basic Distinction) introduces intelligent design (ID) as a scientific theory distinguished from theological approaches such as the doctrine of creation and the traditional design argument. A chapter is devoted to distinguishing ID from scientific creationism.

Part Two (Detecting Design) outlines the design inference, specified complexity, and explanatory filter, and calls for a truly scientific approach that follows the empirical biological evidence and does not prejudge the answer by denying the possibility of anything other than undirected natural causes.

Part Three (Information) points out that information is fundamentally different from matter and questions whether undirected natural forces are able to bridge the vast gulf between the inorganic world and the information-rich organic world. Information also opens the possibility of a designer affecting the physical universe without being an interventionist: "Unembodied designers who co-opt random processes and induce them to exhibit specified complexity are not required to expend any energy. For them the problem of expending energy to move material objects simply does not arise."

Part Four (Issues Arising from Naturalism) throws down the gauntlet to methodological naturalists, who hold methodological naturalism as a dogma that not only "takes evolution as God's method of creating life but rules out of court the possibility that God might have left any empirical fingerprints." Recent religious naturalism does not allow for supernatural intervention and thus rules out the possibility of predictive prophecy and miracles. Dembski considers the contrast between natural and supernatural causes to be wrong. For him the proper contrast is between undirected natural causes and intelligent causes. "Intelligent causes can work with natural causes and help them to accomplish things that undirected natural causes cannot."

Part Five (Theoretical Challenges to ID) has Dembski the philosopher and mathematician answering the more detailed and technical criticisms of ID. Some chapters are not easy reading, though I particularly enjoyed his insight into David Hume whom I found difficult in my undergraduate days.

Part Six (A New Kind of Science) shows that Dembski is conscious of being part of a new revolution in science, hence the title of the book. Not only does his book make another major new contribution to the design movement, but this part also outlines a course of action for what needs to be taken to ensure that ID does not fizzle out but becomes a widely accepted and truly testable science including aspects of refutability, confirmation, predictability, and explanatory power.

*The Design Revolution* is highly readable with many illuminating, down-to-earth illustrations. All thinking scientists will enjoy the read, even if it is only to sharpen their own rhetoric skills. Dembski is widely read and interacts with the leading voices of a wide range of disciplines. His logic is at times devastating and more than once he comments on the irony of a particular attack against ID. His chapter on Selective Skepticism is highly amusing.

*Reviewed by Bryan Ezard, 14 Graham Street, Goolwa, 5214, Australia.*

**PHYSICS OF GENESIS** by James Allen Thompson. Las Vegas, NV: Chiron Development, 2004. 145 pages. Hardcover; $14.99. ISBN: 0974494518.

Thompson, a graduate from Portland State University, has a degree in theology from Luther Theological Seminary. He has also done post-graduate work at the Graduate Theological Union in Berkeley and written a number of articles on a variety of subjects and two other books on theological issues.

*Physics of Genesis* is divided into two sections. The first part is a look at the biblical book of Genesis to study the text and determine what type of literature it is. The second part of the book is an investigation into the assumptions of Darwinism and the methods of science. Although Thompson quotes many authors and articles, there is no bibliography nor any footnotes. There is one minor illustration.

The premise of this book is that one need not take a side in the creation/evolution debate. The important thing is the debate itself and what we can learn from it. His first point is his conclusion that Genesis is a scientific treatise based on the best research available at the time, that of the Ionian empiricists of the fifth–fourth centuries BCE. The emphasis of Genesis is not God creating but a process of creation that relies heavily on the operation of laws and mathematical principles. The main question of Genesis is not, "Is this universe a work of God?" but "Is the world structured to natural laws as defined in Pythagorean and Ionian terms?" His second point is that Darwinism is a religion, not a science. Darwinists make passionate statements of faith, not of scientific fact.

That Genesis is scientific literature is not a new concept, but Thompson's argument that the writer of Genesis based his writing on the Ionians and Pythagoreans is innovative. That Darwinism is a religion many creationists have concluded for decades. Thompson adds no new material to the argument although he does review many of the current facts.

Thompson quotes Genesis One a great deal, but he has a habit of quoting only part of the indicated statement. He frequently leaves out "and God said," claiming God is not actively present as plants and animals develop. He also uses his own translation to "prove" that the earth sprouted greenery without God's action. One can certainly disagree with Thompson in his assumption the language of Genesis One is passive rather than active, showing God's commands in creation.

Thompson's selective quoting of partial statements as complete ones in Genesis makes one leery of his quotations from various scientists in the second part of the book. The quotes are not footnoted and rarely are page numbers given. Without research, there is no way of knowing if Thompson is quoting statements in part or out of context.

The significance of this book is limited. Those who appreciate a well-documented and precise argument will find this book frustrating. The book is self-published and lacks the benefitting work of an editor. Thompson seems to have acquired his scientific insights from reading the books of others, such as Michael Behe, Philip Johnson, Richard Milton, and Richard Dawkins. Thompson adds nothing new to the discussion other than his own philosophical musings.

*Reviewed by Joan Nienhuis, owner of His Place Christian Bookstore, Oak Harbor, WA 98277.*

**UNCOMMON DISSENT: Intellectuals Who Find Darwinism Unconvincing** by William A. Dembski, ed. Wilmington, DE: ISI Books, 2004. 306 pages, notes, appendix and index. Paperback; $18.00. ISBN: 1932236317.

Dembski, associate research professor at Baylor University, is the author/editor of numerous books and articles. In this book, he has compiled a series of articles from authors critical of some aspect of Darwinian theory. He says that the purpose of the book is "to expose and unseat the myths that have gathered around Darwinism." The book has fourteen chapters by authors such as Koons, Johnson, Shûtzenberger, Pearcey, Denton, and Behe. Each author outlines his or her problem with Darwinism.

Koons describes five stages of science, says that Darwinism is at stage 1, but then acknowledges that ID is also at stage 1. Johnson's essay is fourteen years old, outdated, and lacking any mention of the progress made in the late 1990s on the origin of phyla. Budziszewski and Pearcey try scaring parents about the theological implications of evolution. Pearcey said things like: a reason for challenging evolution is so that churches and seminaries will not feel forced to accept evolution. That, of course, seems to ignore the bigger question: Is evolution true? If it is, then churches should accept it.

It is Edward Sisson's article which will most enrage scientists who seek for truth. Sisson is another lawyer who thinks that scientists build a case like a lawyer does—amorally lacking any regard for truth. He likens scientists to the lawyer who decides what must be true for the client to win and then seeks out data to support that view. That may be how ID works, but it is not how science works.

Frank Tipler argues that peer-review should be scrapped. None of Einstein's papers were peer reviewed; he cites numerous cases of leading scientists getting their Nobel Prize-winning papers rejected. That being said, the article was clearly chosen to try to make the case that ID proponents are not allowed to publish their papers in scientific journals. The chapter does seem a bit self-serving since one of Dembski's books was published by Cambridge University Press, hardly a scientific backwater.

The best article is by Denton, who tells his story of how he moved from biblical literalist to an almost deistic evolutionist in which teleology lies in the laws of nature. Denton's article undermines the ID case. He notes that there is no evidence today for anything remotely resembling a program which specifies in detail the phenotype. Thus he denies the very basis of complex specified information!

With Denton's article the book becomes incoherent. Many of the dissenters say evolution happened. They doubt that we have all the details of evolution correct. These authors make one understand why ID will not work.

James Barham is an emergentist, in which complex systems give rise to phenomena greater than the parts. He questions the ability of natural selection to create behaviors in which 1940s Germans, at the cost of their own lives, came to the defense of their non-kin, Jewish neighbors. He argues that the properties of life emerge from the laws of the universe. Such views hardly help the ID case.

Roland Hirsch criticizes evolution for not anticipating certain discoveries, but then fails to apply that approach to astronomy and physics which also do not always anticipate their discoveries. Cornelius Hunter uses classical misunderstandings of the fossil record to claim that it does not support evolution.

Langdon also seems to argue for a self-contained universe, one at odds with the ID viewpoint and fully in line with the evolutionary paradigm. Indeed, if Langdon is correct, there is no need for God because Langdon proposes that nature brings forth both itself and logic from a self-contained system. One might wonder why Dembski thinks killing off Darwinism with this view is a good idea for theology.

The book is worth owning for the two articles by Tipler and Denton. The book lacks a really coherent message through the articles and does not achieve Dembski's goal. Dembski seems to believe that anyone who has something bad to say about Darwinism, even if they are evolutionists, makes a case for ID. It is hardly uncommon for scientists to have dissenting nitpicks with current theories.

*Reviewed by Glenn Morton, 10131 Cairn Meadows Dr., Spring, TX 77379.*

## RELIGION AND CHRISTIAN FAITH

**THE MAKING AND UNMAKING OF TECHNOLOGICAL SOCIETY: How Christianity Can Save Modernity from Itself** by Murray Jardine. Grand Rapids, MI: Brazos Press, 2004. 304 pages, bibliography and notes. Paperback; $24.99. ISBN: 1587430703.

Jardine is an associate professor of political science at Auburn University. He has written another book, *Speech and Political Practice*, that provides a lens which he uses to examine our technological consumer society from a biblical perspective.

This book is divided into three parts, each divided into chapters. Part I traces "The Evolution and Crisis of Modern Technological Societies" through a stunning whirlwind of political philosophy from Plato and Aristotle through Hobbes, Locke, and Mills. The Enlightenment foundation of our modern technological society is explored. Jardine does an excellent job of showing exactly why it was inevitable that Western culture developed the way it has. He also asserts that to continue to follow this trajectory is self-destructive. Jardine's expertise is in political philosophy and it clearly shows. Part I alone makes the purchase of this book worthwhile. His arguments are original and compelling.

Part II explores how Christianity relates to the current social crisis in the West. Jardine traces Christian theology and its incorporation of Greek ideas that subtly altered the basic Christian Gospel until the Enlightenment secularized the Protestant work ethic and turned it into an engine driving society, into capitalism, and ultimately, consumerism.

Part III is Jardine's attempt to sketch out a rough "Christian Response to the Modern Crisis." He makes no claim to have all of the answers, but instead puts forth some ideas about how neighborhoods could be structured, work could be re-imagined, and what our care of the aging could look like. His view is that Christian churches cannot stop modernity from self-destructing, but that they can provide examples of alternatives when the house crashes down. This part was a little disappointing, if one is looking for concrete action plans, but it provides food for thought. It is a starting point.

This book was impossible for me to put down. The pace of Part I and the tying together of seemingly unrelated observations placed our current social situation in an entirely new context. Jardine is unafraid to let the chips fall where they may when pursuing truth. Readers will, at some point, find basic assumptions about modern life challenged. His use of the Bible to analyze the current cultural "narrative" was well done; he does not look for exact proof-texts, but rather looks for biblical truths stated in broad strokes. I recommend this book to anyone who wants to explore *why* our culture is obsessed with technology without the ability to display moral restraint. It is primarily a philosophical book and not a technological one. For this reason, it is a breath of fresh air in a society that has almost forgotten that the question "why?" is every bit as important as the question "how?"

*Reviewed by David Condron, Marine Engineer, Friend Ships, Lake Charles, LA 70601.*

## Social Science

**THE FIRST IDEA** by Stanley I. Greenspan and Stuart G. Shanker. Cambridge, MA: DaCapo Press, 2004. 456 pages plus notes, and bibliography. Hardcover; $25.00. ISBN: 0738206806.

This is the third book for Greenspan, a professor at George Washington University, and the second for Shanker, a professor of philosophy and psychology at York University in Toronto. The book is divided into four parts with fifteen chapters. It attempts to explain how symbol use, language, and thus social groups form both in individual development and in human evolutionary history. Their thesis comes from work with autistic children and with the symbol-using apes in Sue Savage-Rumbaugh's lab.

Greenspan and Shanker base their view upon the observation that to form symbols, a human infant must invest the word with emotion. Apples are not "just red and round." They are something you proudly give to a teacher or eat to keep the doctor away. The authors contend that without an ability to separate perception from action, symbol use does not appear. Autistic children have problems forming symbols and thus they act out their perceptions rather than symbolically think about the situation. The authors contend that many of the ills of society are due to inhibited formation of symbol use in childhood. They apply this concept to issues like the failure to install democracy in some nations (e.g., Iraq does not have the proper child nurturing process). In the middle ages, children were swaddled and given little attention, but Renaissance care-giving was more interactive between parent and child, leading to a symbolically thinking nation. Infancy and childhood gradually lengthened over the past five million years allowing more parent-child interaction which they correlate to the rise of language and art.

The authors overreach by making childcare practices the basic unit of the psychological universe, a bit reminiscent of Milesian philosophers who, instead of choosing water as the basic element, choose emotion. The authors are radical Lockelean empiricists. Our use of symbols, and thus language, is not hard-wired into the brain or genes as Chomsky and Pinker have argued. Each generation must, through child-nurturing practices, pass on symbol and language use to the next generation. What of the human universals, things like facial expressions, language, laughter and the brain's language centers? Are they not genetically determined? They argue we are born a *tabula rasa*, using Locke's terms. They acknowledge this might be considered heretical by their fellow scientists.

The authors claim biology only brings to the table a neural system capable of being programmed. They claim, a bit like Lamarck, that the culturally programmed items, like language, are not affected by our genes at all. This ignores Bickerton's observation that children raised where pidgin languages were spoken (languages without fixed grammar which occur in polyglot settings), instantly create new languages with fully-formed grammar. Who teaches the children the grammar? It is not the caregivers who do not have it. They do not explain why, barring pathology, the same part of the brain forms the language center in almost all humans. Caregiving cannot be responsible for that, can it?

This claim that symbol use only needs a pliable brain raises the immediate question of why my cat, orphaned at one week, raised by nurturing humans, still likes to chase small furry things rather than type on my computer keyboard like me. The same question can be asked of chimps raised by humans in human homes. The case for absolutely no role for nature as opposed to nurture, seems the weakest part of the book.

An amusing aspect of the book is that the authors take political correctness to its extreme. Not a single male infant is discussed in the book—all are referred to as "she," even when they are playing with trucks. A sarcastic individual might wonder why they never study male infants. One anthropological error is that they say the earliest recognized representation of a face, the Makapansgat pebble, was found in 1998, when it was found in 1925.

The book is a must read for anyone interested in the issues of human evolution, especially the evolution of cognition. While the authors may not solve the problem of the origin of speech, they do have significant things to add to the discussion.

*Reviewed by Glenn Morton, 10131 Cairn Meadows Dr., Spring, TX 77379.*

**THRIFT AND GENEROSITY: The Joy of Giving** by John M. Templeton, Jr. Philadelphia, PA: Templeton Foundation Press, 2004. 107 pages. Hardcover; $12.95. ISBN: 1932031715.

This book puts forward the idea that thrift and generosity produce large returns, one of which is joy. Thrift is part of a spiritual and cultural understanding of how time, talents, and resources are used. Thrifty people make careful, thoughtful, wise decisions about how to expend their resources. Generosity is sharing what you have with other people, especially the needy. Thrift can provide the means to practice generosity. The author illustrates these two virtues with quotes from the Bible, literature, philosophy, and daily life.

Templeton includes many trenchant quotes, especially from Benjamin Franklin. Franklin on thrift: "Buy what you have no need of, and before long you will sell your necessities." Generosity enables us "to welcome the weeping widow; to provide for her a place to rest; to dry up her tears; to feed and educate her little orphans, and to put them in a way to gain an honest livelihood."

The quotes in this book provide splendid fodder for a sermon or talk. They alone are worth the price of the book. Templeton uses them to great effect to show that in practicing thrift and generosity "a bit of fragrance always clings to the hand that gives the rose." A life of altruism may be the only way to joy: "When sailing on the Titanic, even first class cannot get you where you want to go." It is worth noting that Jesus said you will be more blessed if you are on the giving rather than the receiving end.

This is a wonderful little book, full of pithy observations, illuminated with many illustrations, touching the heart as well as the purse strings. It points its readers in the direction of finding peace, happiness, and freedom by giving them to other people. The author practices what he advocates. In 1995 he retired from his medical practice to direct the activities of the John Templeton Foundation, an organization whose goal is to encourage the advancement of religious and scientific enterprises.

*Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.*

# Letters

## Are Patriarchal Ages Factual or Fictional?

Richard Johnson highlights several remarkable patterns in his letter, "Patriarchal Ages in Genesis" (*PSCF* 56, no. 2 [2004]: 152–3), endorsing the conclusions in Carol Hill's article, "Making Sense of the Numbers in Genesis" (*PSCF* 55, no. 4 [2003]: 239–51). Both writers agree that the numbers should be interpreted symbolically, not literally, evidently assuming that while God or inspired bards might contrive lovely patterns, factual ages would be more typical of documented life spans and less aligned with cultural preferences or numerological symbolism. Finding similar patterns hidden in ancient Mesopotamian texts would support the idea that Genesis has fictional and symbolic numbers, but can any evidence be found that they are factual and literal after all?

Consider remarkable patterns of numbers related to US presidents. Only eleven were elected in a year evenly divisible by twenty. Of these, all but the first two and the last two died while in office (Harrison, Lincoln, Garfield, McKinley, Harding, Roosevelt, and Kennedy), and these seven all died in a year whose final digit was 1, 3, or 5. Only one other president (Taylor) died in office (in 1850). The sum of the numbers for the month of death of the seven presidents is 49 ($= 7 \times 7$). This is admittedly less impressive than the patterns Johnson noticed, but suppose someone living in the distant future sees patterns in a history of these presidents and concludes that the numbers must be fictional and symbolic. The idea might pass muster if no confirmation of the factuality of the death dates can be found at the time.

Gerald Aardsma may have found just the sort of confirmation of historicity that should be lacking if the Genesis numbers are fictional. Using these numbers, he constructed a chronology stretching all the way back to the creation of Adam ("Toward Unification of Pre-Flood Chronology," *The Biblical Chronologist* 4, no. 4 [1998]: 2). Johnson's pattern observations range from Adam to Moses. Although no events earlier than Noah's flood are likely to have left identifiable and accurately datable vestiges, this event can be dated to a time consistent with the Aardsma chronology, as explained in my earlier letters, "On the Hills of Concordism and Creation Science" (*PSCF* 55, no. 4 [2003]: 278) and "Do Ice Cores Disprove Aardsma's Flood Theory?" (*PSCF* 56, no. 1 [2004]: 76–7). This finding, if it holds up under closer scrutiny, suggests that the numbers are factual, at least from Noah on.

Has anyone noticed that 777, the age of Lamech, is 3333 when written as a base-6 number? How many other base-10 numbers have a similar property? Johnson said his letter did not cover all the patterns he had noticed, so there must be even more, but if the numbers are factual and Aardsma's chronology is correct, then they will be consistent with all verifiable facts, regardless of how improbable or culturally symbolic the number patterns may be. Has any clear inconsistency ever been demonstrated?

Abraham's age (175) heads one of Johnson's patterned lists, but Aardsma claims secular synchronization with his period as well, citing Gen. 13:10 and a modern study of salt caves near the Dead Sea ("Mount Sodom Confirms Missing Millennium," *The Biblical Chronologist* 1, no. 1 [1995]: 1–4). Although further confirmation would certainly help, Aardsma corroborates traditional acceptance of the Genesis numbers as literal, factual ages, favoring the sovereignty and creativity of God (Ps. 139:16; Isa. 40:22–24, 42:5, 46:10–11; Acts 17:24–28) as still the best explanation for patterns.

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## Only One

Williams and Dickerson have *not* described two different systems (*PSCF* 56, no. 2 [June 2004]: 102–10). While their pentagram clock has only five settings, any account of prior history (e.g., # revolutions) would provide "infinite" settings as easily as the hypothetical history that supplements the "other" system. Their *example* of modulo 5

arithmetic confuses the issue of whether their "system" is defined by its parameters or by an infinitely expandable *record* of arbitrary signals interacting with the system. Modulo 5 addition has an explicit goal of *discarding* higher order information in favor of repeating a count; it is no different from the clock. In modulo 5, the series of 0, 5, 10, 15, ... is "infinite" only in the trivial sense that the series 0, 0, 0, 0 ... is "infinite." If we discard one clock's history and compare it to the "infinite" potential history of another, infinity appears to "equal" five. It is almost a good card trick. But, in fact, the authors' two systems are the same.

Contrastingly, Abba's record is intact, inherent, and (humanly) irreducible. Triune *theory* is the entity that is modulo-like, for it forgets that higher order information exists (e.g., only Abba knows when the Son of Man will return; Matt. 24:36). The two real "systems" are not "equal" or "consubstantial" in their "substance." One is greater, just as Jesus repeatedly said (e.g., John 14:28).

The authors apologize for the model's limitations by bowing to paradox. If paradox is the appeal, consider the *original* version: Elohim made humankind in his image. Even so, he cannot be described or likened to *anything*. No image of him can be made, no attribute encompassed. This includes his metaphysical "substance." Some people refused to accept the paradox; they decided God is Jesus the Messiah, that Elohim is the second Adam, that the *icon* of God—double-click and the program opens—*is the program*. But if anything finite can be a "fullness" of infinity, then perhaps, like the authors' models, we are all "full" of the things we have forgotten, and perhaps we are all divine—at least as much as Athanasius, who advocated that Christ *had* to pay an "infinite" price or he (Athanasius) could not become God Almighty.

How many can recite Jesus' answer to the question, "Who is this 'Son of Man'?" (John 12:34). Why did Jesus recite, "Ye are gods"? (John 10:34, Ps. 82). If "God in Jesus" equals incarnation, what does "Jesus in us" equal? (John 14:20). Contemporary Trinity forgets dozens of such verses, while fourth century Trinity is blatantly self-glorifying; both are illogical. Is the *logos* to be defined in *illogos*—logic by illogic, reason by the incomprehensible, words by hand-waves? Few concepts are as antithetical to science or the Gospel.

Since Jesus is the first-fruit—the first born into the Resurrection—the beginning of the new Creation, what does *beginning* mean? Is Jesus the foreordained Messiah who existed prior to his "begetting"? Yes, but Paul tells us "begetting" (*yalad*) refers to the *resurrection* of the man Jesus (Acts 13:33, Ps. 2). The word *beginning* means both less and more than Trinity presumes.

Newton decided Trinity is a fraud. This remains the logical and consistent conclusion on the matter. Williams and Dickerson imply disbelief by Isaac in regard to the "miraculous and mysterious" (p. 104). But others degrade Newton for suggesting that God adjusts his clockworks. Which is it? Is Newton's God too tiny or too big, too distant or too close? Which caricature makes Trinity right?

Trinity is *still* without mathematical blessing, congruent with its lack of scriptural vocabulary or clear support. It is short on mere (non-fraudulent) scriptural *hints* that can be "taken" in its favor, yet foundered in opposing verses, tainted by paganism, surrounded at every stage by controversy, bloodshed, and persecution and completely without a logical, sensible, or comprehensible foundation. Superstition is about forgetting the real question and focusing on fantastic speculations; science and Christianity are antithetical to this. Oh barbarian brothers in Christ! Why do you call our master "Good"? Only God our Father is Good (Matt. 19:17); only God is God.

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## Old Glaciers

Derek Eshelbrenner's Letter (*PSCF* 56, no. 2 [June 2004]: 156-7) on Paul Seely's article about Greenland's Ice Glacier was entertaining but did not have much depth to it. Derek indicates that the Greenland Ice Glacier might have floated in one spot during the six months or more of the Genesis flooding. I am sure Derek has not thought it through, how high the Greenland glacier would have had to float as it hovered over Greenland Island during the turbulent Genesis flooding.

The Genesis story says that the flood water "... prevailed so mightily upon the earth that all the HIGH mountains ..." were covered by fifteen cubits of water. Nine out of the ten highest peaks in the world reside in the Himalaya range and climb up to 29,035 feet for Mt. Everest. From the Genesis story, the flood waters would have had to top Mt. Everest, so Greenland's glacier hovered for six months at about 5½ miles high above Greenland's island. That would be quite a feat and I am sure not impossible for God to do. But if God did that for this old Glacier, he would have done it for all of the other old glaciers in the world.

Most people do not realize that there are over 71,000 glaciers that are currently being monitored by the World Glacier Monitoring Service, WGMS.[1] Most of these glaciers are known as short timers, a few thousand years, but there are many that are showing to be very old by the process of cutting deep Ice Cores into them.[2] The Bolivian ice cores indicate a 25,000 year tropical climate history[3] and it goes up to 220,000 years before present [1995] at the Vostok Station in Antarctica[4] and the most recent analyses, 1997, of the Guliya Ice Cap in the Kunlun Shan Mountains of western China suggest a record of more than 500,000 years old.[5]

I for one do not understand why God would keep a 200,000 year old glacier floating above one spot of the earth during the Genesis flood and then drop it back down on the island it came from? How would that show that we live on a very young earth?

I would think the very evidence that there are many glaciers that are from 25,000 years up to 500,000 years old completely destroys the very concept of this earth being only 6,000 years old. Derek admits that there is no evidence for a worldwide Genesis flood but hopes that "science " will "demonstrate that a global flood did occur." The problem with Derek is he does not realizes that "science" has already accumulated tons of evidence that "demonstrate that a global flood" could not ever have happened in the last 200,000 years. Every year archaeolo-

gists keep finding more evidence of humankind being around on this earth for more than 40,000 years.[6]

### Notes

[1]World Glacier Monitoring Service Available Data on web at: www.geo.unizh.ch/wgms/wgmshome/data.htm

[2]Ice Cores on web at: www.antarctic.com.au/encyclopaedia/physical/IceCores.html

[3]L. G. Thompson, et al. "A 25,000-Year Tropical Climate History from Bolivian Ice Cores," *Science* 282, no. 5295: 1858–64 on web at: http://polarmet.mps.ohio-state.edu/Icecore/Abstracts/25Y-98.html

[4]"Antarctica - Byrd & Dome C," on web at: http://www-bprc.mps.ohio-state.edu/Icecore/ByrdStation.Dome.html; and S. S. Abysov, et al., "Deciphering Mysteries of Past Climate From Antarctic Ice Cores," *Earth in Space* 8, no. 3 (November 1995): 9 on web at: www.agu.org/ sci_soc/vostok.html

[5]Earle Holland, "Researchers Date Chinese Ice Core to 500,000 Years," Ohio State University News Release (June 29 1997) on web at: www.sciencedaily.com/print.php?url=/releases/1997/06/970629224509.htm

[6]*Past Worlds: The Times Atlas of Archaeology* (London: Times Books Ltd, Harper & Collins, 1996). One hundred pages take you back in time many thousands of years.

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## Abraham Began the 430 Years: Such Numbers Are Not Figurative

Martin LaBar's letter in the previous issue (*PSCF* 56, no. 4 [Dec. 2004]: 308) disagrees with "Gilbert's interpretation of Exodus 12:40" described in my letter on "Genesis Age Gaps?" (*PSCF* 56, no. 2 [June 2004]: 153–4). I simply stated St. Paul's interpretation (Gal. 3:16–17) that the pre-Exodus 430 years began when God gave the covenant promise to Abram. Paul links this promise to the law that was introduced 430 years later and also to Christ. The first expression of the promise that refers to Christ tells Abram "All peoples on earth will be blessed through you" (Gen. 12:2–3). Christ Jesus accomplished that blessing and fulfilled that prophecy (John 8:56).

Abram begat Isaac twenty-five years after that promise was given (Gen. 12:4; 21:5). Isaac begat Jacob at age 60 (Gen. 25:26), and Jacob went to Egypt at age 130 (Gen. 47:9). Add those years up to get 215; subtract that from 430 to get 215 years between the descent into Egypt and the exodus. Josephus wrote: "They left Egypt ... 430 years after our forefather Abraham came to Canaan, but 215 years after Jacob removed from Egypt" ("Antiquities of the Jews," Book 2, Chap. 15:2, in *The Works of Josephus*, trans. Wm. Whiston [1736] (Peabody, MA: Hendrickson Publishers, 1987), 75.

LaBar argues that the 430 years began when Jacob and his sons went to join Joseph in Egypt. He bases his disagreement with Paul on Gen. 15:13, when God tells Abram "... your descendants shall be strangers in a country not their own, and they will be enslaved and mistreated four hundred years" (NIV). LaBar says that "means a captivity of Abraham's descendants, in Egypt, amounting to considerably more than 200 years."

First, "a country not their own" (NIV) is also translated as "a land ... not theirs" (KJV). These two translations provide different interpretations: "country" suggests that Abram was within the boundaries of a particular nation. "Land not theirs" is less specific and simply suggests "foreign soil" or "somebody else's turf." The NIV footnote to Exod. 12:40 says the Samaritan Pentateuch and the Septuagint name both Egypt and Canaan as the places of slavery and mistreatment foretold in Gen. 15:13.

Second, "descendants" (NIV) is a derivative of the primary meaning of the Hebrew in Gen. 15:13, which is "seed" (KJV). "Descendants" restricts interpretation of that word to "offspring already born," whereas the "seed" of Abram obviously went where he went until it joined the seed of Sarah to produce offspring of the promise, who are also included in "seed."

And third, LaBar interprets Gen. 15:13 to mean that slavery occupied many more than 200 years. However, compare "your descendants will be enslaved and mistreated four hundred years" with "Americans had a bloody Civil War and antagonism over slavery for decades." The war occupied only four years of those antagonistic decades, and the Hebrew slavery occupied considerably less than half the 400 years of "mistreatment." Moses, born into that slavery (Exod. 1:8–2:3), led the exodus at age 80 (Exod. 7:7), which indicates that the slavery began at least eighty years before the exodus.

Scripture does not say how long it was between the start of slavery and Moses' birth, but estimates range from 0–1 years (Klassen, 1975) to 38 years (Reece, 1977), according to *The Reece Chronological Bible* (Bethany [1980], 118–9). These estimates indicate a range of 80–118 years of slavery, which is less than half LaBar's estimate. My explanation for the thirty year difference between the 400 years of "mistreatment" (Gen. 15:13) and the 430 years of Exod. 12:40 is that Joseph held power in Egypt for thirty more years after Jacob and his sons joined him (his ages 40–70), during which time the Israelites were treated very well indeed (Gen. 47:11, 27).

For those who think the patriarchs were not "mistreated" (KJV has "afflicted"), consider Abraham's afflictions described in Genesis 12–20, and Gen. 23:2, which has Sarah separated from him at Kiriath Arba, possibly furious over the attempt to sacrifice Isaac, whose own afflictions are described in Genesis 26. Jacob sums up his afflictions in Gen. 47:9 (NIV): "My years have been ... difficult."

In response to Carol Hill's letter (*PSCF* 56, no. 4 [Dec. 2004]: 308), I agree with her point that Adam was around 6,000 years ago; I disagree with her point that Old Testament numbers are sometimes "sacred or figurative." I do not think God lied when he inspired the Scriptures, as attested by two witnesses (Heb. 6:18 and Titus 1:2), even "white lies" for numerological purposes; a patriarch can live to a "sacred" age if God wills it.

I thank my wife Mary Ann for insightful comments about this letter.

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# Letters

## "Human Personhood" and Embryonic Stem Cells

Recent excellent contributions by Boomsma[1] and Mannoia[2] discuss multiple positions related to human embryonic stem cell (hES) research. Both mention briefly the basic question about such work; namely, when does the fertilized egg (blastocyst) become human. Many Christians agree that "Humanness" is not a biological trait but spiritual or supernatural (i.e., the presence of an eternal soul). At what point is the embryo endowed with a soul? There are no definitive Scriptures answering this question but there are both scriptural inferences and scientifically acquired information pertaining to it.

Studies of reproductive biology demonstrate that more than 50% of blastocysts are lost through failure to implant in the uterus or due to death or miscarriage after implantation.[3] Since the population of the United States exceeds 250 million and the birth rate approximates 14 births/1000,[4] the number of births per year in the United States approximates 3,500,000. A conservative estimation is that an equal number of blastocysts are lost each year. Are each of these lost blastocysts fully human and will their "souls" be in heaven? If so, then a high proportion of the population of heaven will be embryos (perhaps the highest proportion, particularly when one expands these figures worldwide!). Therefore, from the perspective of God's economy and redemption, it seems highly unlikely that each fertilized egg is endowed with an eternal soul at fertilization.

The question of when the soul is imparted to the human embryo cannot be clarified scientifically. However, there are Scriptures that shed light on this issue. Exodus 21:22, 23 describe a situation in which two men are fighting and injure a pregnant woman so that she has a miscarriage or a premature birth. There are two main positions on the meaning of these verses. In both, the death of the pregnant woman requires the application of the laws of retribution, i.e., giving "life for life, eye for eye, tooth for tooth, etc." The person causing the death of the pregnant woman must pay with his life. The disagreement about these verses relates to the punishment of the person causing the death of the baby. Clearly, at the time of the writing of Exodus, with the lack of medical expertise, almost 100% of miscarriages and premature births would result in death of the fetus or baby. According to many commentaries, the Scriptures direct that the offender for such occurrences must be fined as the judges determine and the laws of retribution would *not* be in effect. Others interpret these verses to say that the laws of retribution apply just as much for the death of the baby as for the death of the mother. A "middle of the road" position might be that the fetus is not considered human from the perspective of the laws of retribution until it at least is able to survive outside the uterus.

Other guidance comes from passages dealing with the punishment for adultery (Gen. 38:24; Lev. 20:10, 11, 12; 21:9; Deut. 22:21, 22, 24). Here the punishment is always death for the woman. Considering the high frequency of such behavior, it is likely that some of these adulterous women were pregnant or that fertilization had occurred prior to their deaths. Thus, the death of the blastocyst appears to have been of no consequence to the law, suggesting that it was not truly human or endowed with an immortal soul.

Of what relevance does the above information have to stem cell research? Clearly, adult stem cell work is very important, is producing amazing medical discoveries, and should be continued since it does not raise the kind of moral questions associated with embryonic stem cell research. Further, it seems appropriate to question whether the use of pre-implantation or *in vitro* fertilized blastocysts violates moral or scriptural guidelines since 50% or more of blastocysts die from natural causes. A further consideration is that in the medical freezers of our country there are thousands of frozen embryos left over from *in vitro* fertilization procedures and this number is increasing every day.

Research utilizing both types of stem cells appears to have tremendous positive health care potential and the above information should be considered in making decisions about such work.

### Notes

[1]R. A. Boomsma, "Embryonic Stem Cells and a Reformed Christian World View," *Perspectives on Science and Christian Faith* 56, no. 1 (2004): 38–48.

[2]K. A. Mannoia, "An Evaluation of Three Religious Perspectives on Stem Cell Research," *Perspectives on Science and Christian Faith* 56, no. 3 (2004): 216–25.

[3]Edmonds, D. Keith, K. S. Lindsay, J. F. Miller, E. Williamson, P. J. Wood, "Early Embryonic Mortality in Women," *Fertility and Sterility* 38, no. 4 (1982): 255–458; and R. G. Edwards,"Recent Scientific and Medical Advances in Assisted Human Conception," *International Journal of Developmental Biology* 41 (1997): 255–62.

[4]*The World Factbook* (Washington, DC: Central Intelligence Agency, 2003).

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## Concordism Lacks Concord with Both Scripture and Jesus

Peter Rüst's letter (*PSCF* 56, no. 3 [2004]: 235–6) contains a few statements which I think need correction. For one, the consensus interpretations of Old Testament scholars across the theological spectrum should not lightly be set aside as a mere appeal to authority. As in any field of knowledge, the opinions of those with the greatest background knowledge, training, and experience ought to be given precedence over the opinions of the less well informed. The private interpretations of concordism are not well informed and have no more right to set aside the consensus interpretations of Old Testament scholars than the private interpretations of creation science have to set aside the consensus interpretations of geologists and other scientists.[1]

Secondly, Rüst says I made a personal communication to him wherein I recommended the commentary by Alexander Rofé, *Introduction to the Composition of the Pentateuch*. This is a misleading statement since Rofé's book is not a commentary, and I recommended it only as a relatively easy-to-read introduction to higher criticism. I do not agree with everything in the book and very rarely

appeal to higher criticism. He then goes on to identify my view of accommodation with the views of Rofé, Bultmann, and other extreme critics. This is more than misleading, it is misrepresentation of a very serious kind. My view of accommodation is not wildly liberal but a development of John Calvin's view of accommodation, and it stays in principle within his view.[2]

Finally, Rüst says: "Accommodationism leads to unnecessary or even destructive offenses, particularly if moral accommodation is included." Since Jesus understood the implicit permission to divorce-for-any-reason granted in Deut. 24:1–4 as a moral accommodation to the rude cultural mores of the times (Matt. 19:8/Mark 10:5),[3] Rüst's statement makes the accommodationist view of Jesus even more to be shunned than mine. If, on the other hand, Jesus was right in recognizing moral accommodation in the Old Testament, then for followers of Jesus there must be room for accommodation to merely scientific matters as well.

### Notes

[1]Examples of the private interpretations of concordism can be found in "The First Four Days of Genesis in Concordist Theory and in Biblical Context," *PSCF* 49, no. 2 (June 1997): 85–95, also available at www.asa3.org/ASA/PSCF/1997/PSCF6-97Seely.html.

[2]See Paul H. Seely, "The Date of the Tower of Babel and Some Theological Implications," part VIII "Gracious Divine Accommodation to Limited Scientific Knowledge," *Westminster Theological Journal* 63 (2001): 32–8.

[3]The majority of commentaries on Matt. 19:8 and Mark 10:5 explicitly say that Jesus saw Deut. 24:1–4 as involving a concession or accommodation. Those remaining silent on the issue give no evidence of disagreeing with the others on this point.

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## A Further Response to Discher and Madden

Madden and Discher's "What Intelligent Design Does and Does not Imply" (*PSCF* 56, no. 4 [2004]: 286–91) and "What Would Count as Defeating Naturalism? A Reply to Van Till" (Ibid., 296–8), continue the vein initiated by Discher in "Van Till and Intelligent Design" (*PSCF* 54, no. 4 [2002]: 220–31) and "Is Howard Van Till's Response to 'Van Till and Intelligent Design' a 'Right Stuff' Response?" (Ibid., 240f), which they cite as demonstrating their accuracy (pp. 296, 298, note 2). This ignores three critiques, two very negative, by Krause, Blount, and me (*PSCF* 55, no. 1 [2003]: 68–70). In "On Discher's Reply to Van Till," I termed his second paper "dishonest" and "sophistry." Why this needs to be said by Van Till to be relevant (p. 296) escapes me.

Their definition of materialism (pp. 287, 289, 296), criticized by Van Till in "Is the ID Movement Capable of Defeating Naturalism? A Response to Madden and Discher" (*PSCF* 56, no. 4 [2004]: 293), is no longer relevant for it ignores complexity theory, also known as deterministic chaos. Systems are readily rendered unpredictable. The authors would profit from James Gleick, *Chaos: Making a New Science* (Viking, 1987), for they apparently did not understand Van Till's reference to the weather, even though problems with weather prediction are probably the most common example given of chaos. However, much simpler matters can yield nonlinear results and unpredictability.

The authors write: "If it were the case that ID science made a legitimate claim that Darwinian natural selection is unable to explain ... we would be left with a choice between" hoping for scientific progress or rethinking materialism. Consider the situation in which no one can currently present a natural process whereby A has become B, but, of course, ID interventionism can (miraculously?). Obviously, we do not have the required scientific knowledge. But the authors require more for their dilemma: it is impossible to get from A to B by any natural process. This means not just that we will not know, but cannot know of a natural process. To illustrate the matter, of geometry I can confidently say that we will never prove the last theorem. It has been demonstrated that the number of theorems is infinite. But this cannot allow me to declare that a certain theorem will never be known. Yet this requirement is analogous to what the authors require. To continue my analogy, proofs hold only for specific sets of axioms. Axioms may be added or altered. Scientific disciplines are more obviously open-ended, with continued dependence on auxiliary hypotheses beyond the core theory. Euclid's original five postulates and five common notions were similarly dependent on "hypotheses" derived from the diagrams. Hilbert's axiom set is complete, not needing outside information. But such a shift in science with its underdetermined theories and auxiliary hypotheses will not occur, at least not till our glorification.

To apply this to Darwinism, now neo-Darwinism, we find ongoing changes as information arrives from genomics, proteomics, and other areas of discovery. This renders their requirement essentially impossible unless we observe the "designer" zap some creature into an entirely new form. I will expect this, to use the vernacular, when pigs fly.

There is, I believe, another deep problem that the authors have not perceived or, having perceived, deny. Materialism/scientism/ontological naturalism is clearly incompatible with ID, as with my non-ID theism. However, a noted philosopher (whose name I cannot recall) stated that materialism is one of four consistent philosophical views. This means that ultimately it cannot be disproved by anyone. This does not mean that all materialistic positions are consistent. Also, materialism involves more than the simple claim that only matter exists. To be sure, materialism has its problems, but so do all other ultimate philosophical positions. Hence, the aim of disproving materialism by ID is a will-o'-the-wisp, something pursued by those who do not recognize human finitude. I class it as an intellectual task paralleling building a perpetual motion machine.

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## RFE and ID Universes Are Both Supernatural

I was intrigued by Howard J. Van Till's reply in Dialogue III, "Is the ID Movement Capable of Defeating Naturalism?" (*PSCF* 56, no. 4 [Dec. 2004]: 292–5). He equates the unique characteristics of a robust formational economy (RFE) universe with the unique characteristics of a naturalistic universe.

A naturalistic universe proceeding from a naturalistic singularity is uncertain, contingent, and random. In a naturalistic universe, chance or the future is indeterminate to humans and to God. The universe, its capabilities and its potentialities, are natural to humans and to God.

A RFE universe proceeding from a God-designed singularity is ordained, non-contingent and ordered, for God, from all eternity, did freely and unchangeably ordain whatsoever comes to pass.[1] In a RFE universe, chance or the future is indeterminate to man but not to God. God has no contingency plans. The universe is natural to man but not to God. A scientist does his experiments, but God ordains the outcome. Man casts the lot into the lap, "but its every decision is from the Lord."[2] A scientist, as a creature of the universe, cannot determine if the universe is loaded, because the load is supernatural and because there is no comparative universe against which to run experiments.

The characteristics of chance in each universe are distinct and are not interchangeable. Generally, Intelligent Design (ID) speaks against chance in a naturalistic universe.

A RFE universe possesses all the resources, capabilities and potentialities needed for the "formation of every kind of structure, system and organism that has appeared in the universe's formational history."[3] However, the capabilities and potentialities are not natural but supernatural. Every particle and wave retains a supernatural load until heaven and Earth pass away. The universe is God's "Rube Goldberg" device.

An ID universe is ordained, non-contingent and ordered. God's hand-like activity is permitted, for "God, in his ordinary providence makes use of means, yet is free to work without, above, and against them, at his pleasure."[4] Was not God's hand-like activity present when he wove each of us in our mother's womb[5] and when he made the deaf, the dumb and the blind?[6]

Does a particular atom decay at a specific location and at a specific moment in time (1) because the RFE potential activates the decay; or (2) because God speaks to it; or (3) because Christ chooses to sustain it no longer?[7] A scientist cannot determine which cause is operable because all three are supernatural.

The RFE universe and the ID universe are one and the same. They constitute the two sides of a single coin. (See chart below.) Can RFE defeat naturalism? Absolutely not. Can ID defeat naturalism? Absolutely not. RFE and ID are supernatural technologies. Neither is scientific. Naturalism is defeated by the logic and data found in quality science.

No scientific data uniquely and unequivocally support naturalistic evolution, for what could a naturalistic universe do that a RFE universe or an ID universe could not do?

Naturalistic macroevolution is based on "natural causes, both known and unknown."[8] A reliance on unknown causes underscores the fact that naturalistic macroevolution is hypothetical. No *scientific* theory of evolution exists.

The probability of naturalistically assembling the genetic code for an integrated, functional, complex enzyme com-

### The Physical Characteristics of Various Universes as Known by God and as Perceived by Humans

| | NATURALISTIC UNIVERSE | | ROBUST FORMATIONAL ECONOMY UNIVERSE | | INTELLIGENT DESIGN UNIVERSE | |
|---|---|---|---|---|---|---|
| | God | Humans | God | Humans | God | Humans |
| Singularity | Natural | Natural | Supernatural | Natural | Supernatural | Natural |
| Scientific | Yes | Yes | Ordained | Yes | Ordained | Yes |
| Experimentation | Natural | Natural | Ordained | Natural | Ordained | Natural |
| Chance [The Future] | Indeterminate | Indeterminate | Ordained | Indeterminate | Ordained | Indeterminate |
| Uncertainty | Yes | Yes | No | Yes | No | Yes |
| Contingency | Yes | Yes | No | Yes | No | Yes |
| Randomness | Yes | Yes | No | Yes | No | Yes |
| Capabilities | Natural | Natural | Supernatural | Natural | Supernatural | Natural |
| Potentialities | Natural | Natural | Supernatural | Natural | Supernatural | Natural |
| Miracles | Deception | Deception | Supernatural | Supernatural | Supernatural | Supernatural |

posed of 100 amino acid residues is about one chance in $10^{65}$ per try.[9] The maximum number of individual organisms from all species ever existent on Earth is far less than $10^{50}$ individual organisms.[10] Every step of naturalistic macroevolution must be accounted for with fewer than $10^{50}$ tries, but $10^{50}$ tries fails to be enough for the probable naturalistic assembly of even one gene coding for a small, integrated, functional, complex enzyme. Naturalistic macroevolution is an extremely irrational scientific hypothesis.

Since naturalistic macroevolution is a scientific hypothesis, which lacks unique and unequivocal scientific data and which is extremely irrational, it should be excluded from all scientific curricula.

## Notes

[1]*The Westminster Confession of Faith*, "Of God's Eternal Decree," chap. III, no. 1.
[2]Prov. 16:33.
[3]H. J. Van Till, "Is the ID Movement Capable of Defeating Naturalism? A Response to Madden and Discher," *Perspectives on Science and Christian Faith* 56, no. 4 (Dec. 2004): 292.
[4]*The Westminster Confession of Faith*, "Of Providence," chap. V, no. 1.
[5]Ps. 139:13.
[6]Exod. 4:11.
[7]Col. 1:17; and Heb. 1:3.
[8]Van Till, "Is the ID Movement Capable of Defeating Naturalism?" 292.
[9]H. P. Yockey, "A Calculation of the Probability of Spontaneous Biogenesis by Information Theory," *Journal of Theorical Biology* 67 (1997): 387; and J. F. Reidhaar-Olson and R. T. Sauer, "Functionally Acceptable Substitutions in Two α-Helical Regions of λ Repressor," *Proteins: Structure, Function, and Genetics* 7, no. 4 (1990): 315.
[10]A total of fewer than $10^{50}$ individual organisms from all species have existed on Earth over the past 3.5 billion years. *E. coli* are about 2 microns in length and 0.2 microns in diameter. With the multiple filamentous structures, a single organism has a volume greater than 0.25 cubic microns. A cubic meter contains $10^{18}$ cubic microns. Less than $4x10^{18}$ *E. coli* could be stacked into one cubic meter. A collection of $10^{50}$ *E. coli* would fill a volume greater than $2.5x10^{31}$ cubic meters. Earth contains less than $1.5x10^{18}$ cubic meters of water. A volume of $2.5x10^{31}$ cubic meters is $1.666x10^{13}$ times the volume of Earth's water. A collection of $10^{50}$ *E. coli* could fill 100% of all bodies of water on Earth every day for more than 45 billion years, which is some nine times the age of Earth and three times the age of the universe. As a corollary of interest, a total of fewer than $10^{50}$ individual organisms from all species have existed on Earth over the past 3.5 billion years.

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## Stem Cell Research: Critiques and Views

I would like to comment to David Siemens' recent letter (*PSCF* 56, no. 4 [December 2004]: 309) critiquing Kristyn Mannoia's "An Evaluation of Three Religious Perspectives on Stem Cell Research" (*PSCF* 56, no. 3 [September 2004]: 216–25). Our ASA area discussion group, which meets periodically to discuss *PSCF* articles, thought Ms. Mannoia's article was excellent. We did not find her arguments foolish, though Timothy Chen said her portrayal of the various positions could have been more nuanced.

Siemens begins by pointing out contra Stanley Hauerwas that "following our intuitions is not an adequate basis for moral standards." Fair enough, but Mannoia does not say they are. Her reference to intuitions occurs within the larger context of the Wesleyan Quadrilateral and, as she says, "illuminates one facet of truth." Intuition "may suggest that embryos are indeed persons." She makes no other claim for them.

Siemens then attacks Gilbert Meilaender's argument that a person is someone who has a history. This argument, Mannoia says, can be applied to the zygote since it too has a history. Siemens counters that lots of impersonal things have histories. That is true, but the question is one of values, and it is also true that we frequently value impersonal things because of the history attached to them. If we do not value the zygote, it is because we do not value its history, but not valuing its history is the first step in devaluing its personhood. I suspect Mannoia means no more than this.

In this regard, Siemens points out that a large percentage of fertilized ova do not implant. Well, so what? Lots of other people meet tragic deaths. But perhaps a fertilized ova is no person until it implants, or until it reaches a certain stage of development. We simply do not know, so, since we do not know, Siemens' argument is only suggestive, not conclusive.

The same cannot be said of Siemens' reference to Caiaphas' prophecy in relation to personal choice. Caiaphas did not give himself for a sacrifice, he simply—and ignorantly—proclaimed the purposes of God. Therefore Siemens' appeal to the passage has no bearing on the argument addressed.

While it may be true that an ovum stimulated in the right way can produce a viable human being (the reality of Turner females suggests this, something neither Mannoia or Siemens mentions), it is also true that a fertilized egg is the first step to a fully formed human being. Trying to avoid that fact by an appeal to stimulated ova is irrelevant.

Nor does Siemens' attempt to qualify the testimony of the church fathers pass muster. They may not have known precisely when pregnancy occurred, but they spoke in one voice in defense of the unborn when they knew it had occurred.

Siemens then pounces on Mannoia's point that "hES research involves something conceived in the womb." That is ridiculous, he says, since hES uses ova acquired through *in vitro* fertilization. Apparently everyone but Siemens snoozed past that one! Or did they? Since *in vitro* fertilization was unknown until the late twentieth century, the early church would not have addressed it. Plainly Mannoia is trying to apply the principle that a fertilized ovum is the first step toward a fully developed human being to the current situation, and, until very recently, such an ovum would only have been conceived in the womb.

Mannoia purposed to apply Ian Barbour's work to the question of stem cell research. I think she did a credible job. Indeed for an undergraduate she did a remarkable job. I also think it is a shame that David Siemens missed it.

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