

Future Meeting Dates

Churchill College
Cambridge, England
August 2 - 5, 1998

John Brown University
Siloam Springs, Arkansas
July 30 - August 2, 1999

The ASA extends its sincere thanks to

Jeffrey K. Greenberg Program Chair
and

George Bate and Brenda Smith Local Arrangements Co-Chairs



AMERICAN SCIENTIFIC AFFILIATION

52nd Annual Meeting
August 1 - 4, 1997
Westmont College
Santa Barbara, CA

CREATION'S TESTIMONY IN NATURAL HISTORY

Keynote Speakers

Dr. Hugh Ross
Executive Director
Reasons to Believe
Pasadena, CA

Dr. John Suppe
Professor of Geosciences
Princeton University
Princeton, NJ

Dr. Dawn Wright
Assistant Professor of Geology and Geography
Oregon State University
Corvallis, CA

"For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made; so that men are without excuse."

Romans 1: 20 (NIV)



Thursday, July 31, 1997

- 4:00 PM **Registration** —John Page Hall
- 5:15 - 6:00 PM **Dinner** - Ruth Kerr Memorial Student Center
—Main Dining Common

Friday, August 1, 1997

- 6:45 AM **Breakfast** - Ruth Kerr Memorial Student Center
—Reservable Dining Room next to Munroe Dining Room
- 7:30 AM **Field Trip** - Channel Island Field Trip -box lunch included
Leaving from upper parking lot of the Ruth Kerr Memorial Ctr.
- 4:00 PM **Registration** - John Page Hall —Lobby
- 6:00 - 6:45 PM **Dinner** - Ruth Kerr Memorial Student Center
—Main Dining Common, first floor
- 7:30 PM **Welcoming Speakers** - John Page Hall —MPR
Kenneth C. Olson —President, ASA
Stanley D. Gaede —Provost, Westmont College
Jeffrey K. Greenberg —Program Chair, ASA Annual Conference
- 8:00 PM **Plenary Speaker** - John Page Hall —MPR
Dr. Dawn Wright —“Discoveries of Seafloor Exploration”

George Bate —Local Arrangements Chair, ASA Annual Meeting
- 9:00 PM **Mixer** -John Page Hall —MPR
—renew acquaintances with old friends and make new ones

Saturday, August 2, 1997

Logos book store will be available all day through the conference.

7:30 - 8:00 AM **Breakfast** - Ruth Kerr Memorial Student Center
—Main Dining Common

8:15 - 8:45 AM **Devotions and Prayer** —John Page Hall - MPR
Music: Larry and Susan Martin
Devotions: Jack Irvine

8:45 - 9:45 AM **Plenary Speaker** —John Page Hall - MPR
Dr. John Suppe —“The Future Interface of Science and
Christianity”

9:45 - 12:15 PM **Poster Session** - John Page Hall - Lobby —Monte Swan

Ann Hunt, Chair - Page Hall		Gerry Hess, Chair - Physics Hall	
9:45 - 10:10	Natural Hazards: Challenges to the Creation Mandate of Dominion? —Keith B. Miller	Can God's Final Judgment Be Redemptive? —J. David Price	
10:10 - 10:35	The Wisdom of God in the Range of Light —Davis A. Young	Theocosmopoetry: Toward The Literary Genre of Genesis 1 —Denis O. Lamoureux	

10:35 - 11:00 AM **Coffee and Fellowship** - Magnolia Lawn

11:00 - 11:25	A Study of System Dynamics, Stability and Controllability in Biological Composting Systems: Implications for Stewardship and Warnings for Macroecosystem Stability —Steven G. Hall	A Technical Definition of <i>To Create</i> —George H. Blount
11:25 - 11:50	White-Washing Our Records? —Gordon R. Lewthwaite	The Bible As Data —David Dye
11:50 - 12:15	Interpreting Creation: A Case For Interdisciplinary Nature Study —Jeffrey K. Greenberg	The Theology of Creation and Legitimacy of Science: Issues Underlying "Naturalism" and "Creationism" as Paradigms —Walter R. Thorson

12:15 - 1:00 PM **Lunch** - Ruth Kerr Memorial Center —Main Dining Common

1:30 - 2:30 PM **ASA Business Meeting** - Main Dining Common

	Jennifer Wiseman, Chair Physics Hall	Kenneth Lincoln, Chair Voskuyl Library - 108	Craig Allen, Chair Voskuyl Library - 204
2:40 - 3:05	Evidence of "Animal Explosion," Early Cambrian Fossils from Chengjiang, China —Paul K. Chien	Are Truth Claims in Science Socially Constructed? —Kenell J. Touryan	Divine Action and Quantum Locality - A Metaphorical Approach —David S. Oakley
3:05 - 3:30	Coal-bearing Cyclotherms as Testimony of Global Change and Protracted Geologic History —Stephen O. Moshier	The Big Bang of Life —Carl Resler	Intelligent Design Theory: An Argument for Biotic Laws —Uko Zylstra

3:30 - 4:00 PM **Coffee and Fellowship** - Magnolia Lawn

4:00 - 4:25	Myth of Ice Age Destroyed by Gravel Quarry —J. Leon Dennison	Organic and Theoretical Evolution: Fact, Fantasy, Fraud —John M. Vayhinger	Assessing Alternative Explanations for the Apparent Fine Tuning of Natural Law —David S. Oakley
4:25 - 4:50	Assessing Water Quality Using the Colonial Hydroid <i>Cordylophora</i> —Nadine C. Folino	A Proposal for a Development Theory of Biological Origins and Change —Robert F. DeHaan	The Argument From Design Leads to Atheism —John A. McIntyre
4:50 - 5:15	Giant Kelp Forests: Natural History and Human Utilization —Raymond J. Lewis	Mechanisms of Creation in Biology —Peter Rüst	"Hume and Paley Regarding the Machine/Organism Analogy: Paley's Self-Reproducing Watch Revisited" —John T. Baldwin

6:30 PM **Banquet** - John Page Hall —MPR

7:45 PM Special Recognitions

8:30 PM **Plenary Speaker** - John Page Hall —MPR
Hugh Ross —“Ministries on Natural History As Evidence Of Design”
Panel Discussion

Sunday, August 3, 1997

7:30 - 8:15 AM **Breakfast** - Ruth Kerr Memorial —Main Dining Common

10:00 AM Transportation to church - please meet in the parking lot of your dorm

10:30 AM **Worship** - Grace Church, Santa Barbara
Speaker —Paul Ribbe, ACG President

12:15 - 1:00 PM **Lunch** - Ruth Kerr Memorial —Main Dining Common

Jack Swarengen, Chair - Page Hall

2:00 - 2:25	The Glory of God Revealed Through a Telescope —John A. Bloom
2:25 - 2:50	The Nurseries of Stars: Studying God's Continued Creativity in the Universe —Jennifer J. Wiseman

2:50 - 3:15 **Coffee and Fellowship** - Magnolia Lawn

3:15 - 3:40	Cosmic Impacts and Biblical Prophecy —Lee E. Branscome
3:40 - 4:05	Extrasolar Planets Around Sunlike Stars —Joseph L. Spradley
4:05 - 4:30	Harry Rimmer as Antievolution Debate —Edward B. Davis

6:00 - 6:45 PM **Dinner** - Ruth Kerr Memorial —Main Dining Common

7:30 PM **Commissions Meetings**

Bioethics	—Tomuo Hoshiko	—Page Hall
Communications	—Don DeGraaf	—Page Hall
Creation	—Bob Newman	—Physics Room
Global Resources and Environ	—Joe Sheldon	—Voskuyl - 104
History of Science	—Edward Davis	—Voskuyl - 106
Industrial	—John Osepchuk	—Voskuyl - 204
Philosophy and Theology	—Edward Davis	—Voskuyl - 106
Physical Sciences	—Lee Branscome	—Voskuyl - 108
Science Education	—John Wiester	—Kerr Student Center
Social Science	—John Vayhinger	—Kerr Student Center

9:00 PM **Affiliations Meetings**

Affiliation of Christian Biologists —Jerry Hess —Physics Hall
Affiliation of Christian Geologists —Paul Ribbe —Page Hall

Monday, August 4, 1997

7:30 - 8:15 AM **Breakfast** -Ruth Kerr Memorial —Main Dining Common

8:15 - 8:45 AM **Devotions and Prayer** —John Page Hall
Music: Larry and Susan Martin
Devotions: Marilyne Flora

Round Table Discussion —John Page Hall
Should Natural Science Bracket God? Methodological vs. Metaphysical Naturalism and the Quest for Knowledge and Faith

8:45 - 9:30 AM DNA and the Origin of Information: When Science Must Bracket Naturalism —Stephen Meyer

Panel Discussion

9:30 - 10:30 AM Chair: Oskar Gruenwald, Editor, *Journal of Interdisciplinary Studies*
Panelists: Brigitte Dehmelt Cooper, Karl W. Giberson, David Grandy, Phillip Johnson, Stephen Meyer, and Peter Rüst

10:30 - 11:15AM **Coffee and Fellowship** - Magnolia Lawn

11:00 AM Check Out —Please return your key to Conference Services at John Page Hall - Lobby

11:15 - 12:15 PM Round Table Discussion continued

12:30 - 1:15 PM **Lunch** - Ruth Kerr Memorial —Main Dining Common

1:30 - 2:20 PM **ASA Science Education Commission Symposium**
—Voskuyl 108

“The Anatomy of Scientific and Worldview Change: Applying Historical Perspectives to the Teaching of Science”

Welcome and Introduction —John Wiester

Part I - Introduction to the Use of the History of Science in Science Teaching

Paper: “The History of Science in the Service of College-Level

Liberal Arts Science Courses: Perspectives, Resources, and Curricular Models" — Michael Keas and Kerry Magruder

2:20 - 2:50 PM **Panel Discussion:** Edward Davis, Michael Keas, Stephen Meyer, Sara Miles, Jeffrey Russell, and Joseph Spradley

2:50 - 3:10 PM **Coffee and Fellowship** - Magnolia Lawn

3:10 - 3:40 PM **Part II - Worldview Change in Science and Science Education**
Paper: "Paradigm Shifts in Geology and Biology: Geosynclinal Theory and Plate Tectonics; Darwinism and Intelligent Design." —John Wiester

Questions and Answers Period to follow

3:40 - 4:10 PM Scientific Naturalism in American Education: From Methodological Naturalism to an Established Naturalistic Worldview —Phillip Johnson

4:10 - 4:40 PM Panel Discussion: Jeffrey Greenberg, Phillip Johnson, Mark Kalthoff and Michael Keas

5:00 - 6:00 PM **Dinner** - Ruth Kerr Memorial —Main Dining Common

Tuesday, August 5, 1997

7:00 - 7:30 AM Check out and return your key to Conference Services at Everest Hall. If your key is not returned, you will be charged \$40.00 extra.

7:30 - 8:00 AM **Breakfast**

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CREATION'S TESTIMONY IN NATURAL HISTORY

ABSTRACTS

"For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made; so that men are without excuse."

Romans 1: 20 (NIV)

Hume and Paley Regarding the Machine/Organism Analogy:
Paley's Self-Reproducing Watch Revisited

John T. Baldwin
Theological Seminary
Andrews University
Berrien Springs, MI 49104

Although Darwin announced the death of Paley's design argument by the idea of natural selection, respectable members of the post-modern scientific community contend differently. Michael Denton and Michael Behe show that discoveries in molecular biology and computer technology validate Paley's analogy between machines and organisms, thus inviting a revisitation of selected aspects of Paley. His use of the watch-producing watch illustration in its relation to Hume affords a useful point for revisitation.

In the Natural Theology Paley implicitly responds to Hume by introducing the self-producing watch illustration. By doing so Paley wishes to show the inadequacy of Hume's claim that appeal to generation is a sufficient account of the origin of the order in a natural effect such as an acorn. Paley shows that when adequately articulated along the lines of the watch-producing watch illustration, artificial effects can be properly compared to natural effects because the producing cause in both the artificial effect and the natural effect are now shown to be proximate and in some sense internal rendering their comparison permissible.

Paley's telling conclusion is that in both instances cited above, some form of ultimate designing cause is needed. In the end Hume turns for such a cause to some form of an internal, eternal ordering principle, whereas Paley turns to an external, eternal designing cause.

The Glory of God Revealed Through a Telescope

John A. Bloom
Biola University
La Mirada, CA 90639

"The Heavens declare the glory of God . . ." but at the end of the 20th Century we effectively drown out that testimony with streetlights! However, over the past few years the Hubble Space Telescope and other orbiting astronomical instruments have given scientists a richer and deeper view of the Heavens than mankind has ever seen before. Without becoming overly technical, this paper will survey some of these findings and discuss what they imply about the nature of God and his dealings with his Creation.

For example, the cosmic background radiation gives widely accepted evidence that the universe began as an enormous explosion. As a consequence, the matter in the universe can no longer be presumed to be eternal, since it is merely, the "ash" from the primordial fireball. While the background radiation is important because it has moved many secular thinkers to speak of a "creation event", it is also striking because it demonstrates the power of God: the vast amounts of material that we see in the universe through Hubble photos like the "Deep Field" is only a tiny fraction of the total mass-energy picture! The matter created in the Big Bang represents only one-billionth of the total initial energy in the explosion. Thus to get the appropriate scale of God's creative power, we must take $E = mc^2$ and multiply it by about one billion.

Further, modern instrumentation allows us to watch dynamic processes taking place in the heavens: Satellites observing supernovae have detected the gamma radiation associated with the formation of heavy elements, and Hubble has photographed protoplanetary disks in the stellar nurseries of the Orion Nebula. This evidence of a dynamic universe implies that God used processes rather than *de novo* events when creating our own solar system. While these data do not confirm the predictions made by young earth Creationists, they offer ample testimony for the eternal power and divine nature of our Creator.

A Technical Definition of *To Create*

George Blount
Ashland, OR 97520

Much of the confusion relating to the Bible's story of the creation of life derives from an unclear understanding of what it means to create. A true creation may or may not be composed of prior existing parts. A simple example of a creation composed of parts is the Grandfather Clock. Investigating this example indicates that the essential feature that makes the clock a creation is that its description demands descriptive "coordinates" beyond those required for the parts. No hint of time is provided by a description of a pendulum arm or of a weight, but time is required to discuss a clock. We see this same feature throughout all of nature. For example, starting at the level of chemicals, chemical compounds require a more elaborate description than atoms, atoms require more description than electrons, protons, and neutrons, etc. A discovery of a so called "God Particle" would, presumably, end this regression. However, it should be noted that "time" itself is a true creation, and therefore the unviolable rule of "cause and effect" is a creation.

A second feature of a creation is the relation of the parts to each other. This relation is often dynamic.

When the levels of creation are traced to the subatomic and lower, descriptive difficulties arise. These difficulties are similar to attempting to force a time label on a pendulum arm or a brass weight—"time" does not fit. The difficulties are dealt with by either inventing descriptions that suggest dialectic properties such as "indeterminacy", and "complimentary", or by using descriptions that fit only in particular circumstances such as "waves" and "particles." A parallel difficulty is seen in biblical descriptions. The very essence of Deity as described by the Bible has led theologians to invent the descriptive "Trinity." The God who does not "change", and who is always "The I Am that I Am" is spoken of as becoming "angry" or "repenting."

If we must speak of the "complimentary" nature of physical reality is it too much to speak of the complimentary nature of "Free Will" and "Predestination"? Further discussion might include, perhaps, the possibility that the implications of complementarity should be extended to biblical descriptions of the "end times."

Some moral issues that plague our society would be best addressed in light of a strict definition of "to create." As examples: The appropriate reverence and treatment of a corpse, and the question, "is abortion right"?

Cosmic Impacts and Biblical Prophecy

Lee E. Branscome
Environmental Dynamics Research, Inc.
Palm Beach Gardens, FL 33418

Several of the catastrophic events in the Book of Revelation and other parts of the Bible appear to describe the collision of the Earth with a near-earth object (meteorite, asteroid or comet) and the associated post-impact effects on the atmosphere, hydrosphere, biosphere, human life and civilization. Elements of this speculative interpretation can be found in two recent books, *The End of the Age*, an apocalyptic novel by evangelist Pat Robertson and *Rain of Iron and Ice*, a popular science book on cosmic impacts by John S. Lewis, a widely respected planetary scientist at the University of Arizona. This paper addresses the likelihood and probable consequences of such an event and evaluates the hypothesis with respect to the Biblical texts.

Recent interpretations of the paleontological, geochemical and geological records suggest a link between very large impacts and massive extinction of species. Of course, the human species has not been on the planet long enough to have experienced such an impact. However, the 15-megaton airburst over Siberia in 1908 gives us a sense of the energy involved in a collision with an object of modest size, perhaps 30 m diameter. A collision with an object of a few km diameter will likely

cause a global catastrophe that will threaten civilization. The sequence and character of the catastrophic events described by the Apostle John in the Book of Revelation are strikingly similar to the potential global catastrophe described in NASA's Spaceguard Survey report of 1992.

Harry Simmer As Antievolution Debater

Edward B. Davis
Messiah College
Grantham, PA 17027

Much recent historiography has underscored the shallowness, futility, and wrong-headedness of treating controversies involving religion and science simply as skirmishes in an ongoing, inevitable conflict between contradictory ways of viewing the world. But what about the phenomenon of antievolutionism, apparently a classic instance of warfare between religion and science? This paper argues that creation/evolution debates are best understood not as examples of "warfare" between religion and science, but as clashes between competing varieties of "folk science," philosopher Jerome Ravetz' term for the use of science to support one's world view, whether this is done by professional scientists or others.

The particular case in question is a 1930 debate between evangelist Harry Rimmer (1890-1952), the leading antievolutionist in America after the death of Bryan, and Samuel Christian Schmucker (1860-1943), a biologist with a national reputation as a populizer of evolution. We tell the story of that debate, sketch the lives and beliefs of the two principal characters, and argue that Rimmer's fundamentalist antievolutionism and Schmucker's evolutionary theism were competing varieties of folk science. Each man practiced folk science by using what he took for science in support of his own world view; each variety of folk science came with its own set of assumptions about knowledge, purpose, and the nature of God; and each was appreciated by a different segment of the population, one popular and the other more elite.

Several slides will be shown and a rare tape of Rimmer's voice will be heard.

[This paper is based on my essay, "Fundamentalism and Folk Science Between the Wars," Religion and American Culture 5 (1995), 217-48, which was named an Exemplary Essay in Humility Theology.]

A Proposal for a Development Theory of Biological Origins and Change

Robert F. DeHaan
Philadelphia, PA 19118

A scientific theory of biological origins and change derived from developmental principles will be presented. Development is one of the most ubiquitous processes in the biological world. It is the engine that drives the cascade of changes that occur in individual creatures, from fertilized egg to mature adult through senescence, in all complex organisms or modern design. It is described in scientific literature as an end-directed, internally driven, hierarchical process. Developmental principles are currently applicable only to individual organisms. They also have the capability, however, of illuminating changes that occurred in major groups of animals, called phyla, over the history of organic life during the last 530 million years. Development of major groups of animals, called *phylo-development*, has not been utilized, largely because macroevolutionary theory dominates studies of this geologic period. Phyla-development, will be presented as the primary motor which drove changes that have occurred in the great groups of animals during this geologic time. Developmental principles will thus be applied to large-scale, historic changes in major animal groups as well as to individual organisms. What place does Darwinian theory have in this framework? Darwinian mechanisms add adaptive variations to the major innovations brought about by phylo-development, thereby enhancing the survivability of the phyletic lineage. Development is the process, moreover, underlying biological design. It will be presented as the Creator's instrument of choice for bringing about both individual and large-scale innovative biological design.

Myth of Ice Age *Destroyed* by Gravel Quarry!

J. Leon Dennison
Quaternary Studies
Olympia, WA 98506

The alluvium of the Western basin valleys indicates that a recent, powerful event washed gravel and boulders out of the Western mountains and deposited them miles out into the basins. At Coalinga, CA, a 150 foot deep gravel pit exposes the cross section of the top 150 feet of basin's alluvial fill, which is composed of rounded, polished, gravel with a high boulder content. The pit is located in the middle of a 40-square mile basin insert into the Coast Range at the west edge of the San Joaquin Valley. A high percentage of the rocks in the pit are very hard and ideal for use as aggregate. Much of the gravel and many of the hard cobbles and boulders in the pit were transported from deposits 20 or more miles upstream. Some of those

cobbles and boulders have flat bottoms. What magnitude hydraulic force could push and tumble those large boulders through the canyons and deposit them four miles out in the basin? The drilling logs of nearby water wells show that the alluvial gravel extends down to depths in excess 1200 feet. The low ridge, which separates the basin from the San Joaquin Valley, is a series of sine waved hillocks. The sine wave is a current mark, and these sine waves have peak to peak lengths which are longer than one-quarter of a mile and as long as one mile. The height magnitude of the waves varies from as little as six feet to as much as several hundred feet.

Analysis: If the great glaciers were a product of Noah's Flood, then ice bergs and ice sheets formed in one area would have or could have floated to another location by the currents of the Flood. Directly east of Coalinga at the eastern side of the San Joaquin Valley, there is a "Mima Mound" type surface feature. One of the best explanations for the Mima Mound feature is that it is a place where an ice sheet or berg sat and melted. It leaves the surface clay eroded inot little, dimpled mounds. The surface clay is compressed into hard pan by the great weight of the once overlying ice sheet. The one mentioned above has the hard pan clay, dimpled into mounds about two to three feet high and six to ten feet across. This feature adjoins a deposit of glacial type crushed gravel. It is located at 400 feet elevation at the edge of the notoriously hot San Joaquin Valley. The southern end of this feature even has a shallow deposit of glacial crushed gravel. (Gravel that is jagged not rounded by tumbling alluvial action.) Between Coalinga and the "Mima" feature, is CA's Kings County. It is located almost in the exact center of the San Joaquin Valley. Thousands of logs, buried in the Pleistocene alluvium taint the aquifer water with hydrogen sulfide. Just to the north in Madera County, thousand upon ten thousands of disarticulated Pleistocene bones lie just below the surface. The bones are buried under a 20 to 40 feet surface layer.

The gravel features of the Coalinga basin which are indicative of great quantities of water acting at high speed are repeated to hundreds of locations throughout the mountainous West. Mima Mound features are reputed to extend as far south as Baja, California. (The one above is one of two that I have found in my own field research.) Water well driller's in many basins throughout the West have found buried wood of Pleistocene age. The bone deposits of Madera County are like the other great Pleistocene bone deposits. Blackwater Draw, in eastern New Mexico next to the Texas border is another type location.

Most of the gravel is glacial moraines and deposits is rounded alluvial gravel, not the squarish, jagged edged product of glaciers rubbing against rock. If the glaciers are a direct result of the Noachian Flood, then most of the gravel in the moraines is the product of alluvial action. The great ice sheets simple plowed the alluvial deposits into moraines. This plowing and movement action would have taken place while the waters of the great Flood were decreasing on the face of the earth. The great ocean currents, that great wind mentioned in the Bible, and the force of

gravity working on the iced sheets own weight and plasticity was the physical force behind this plowing action. (I have found in my own field studies where an ice sheet slide down the steep face of the mountain, forming a moraine to the side. That is in the mountain range directly north of Elko, Nevada.)

The Bible as Data

David L. Dye
Mercer Island, WA 98040

By perceiving Bible statements as *data*, much as we use the term in scientific studies, it is possible to resolve many of the controversial issues between scientists and evangelical Christians. Scriptural data are revealed and inspired, as well as revealing and inspiring. Although Biblical data are in the form of Physical world data (e.g., ink patterns on paper) they reveal the existence and some features of an otherwise unobservable Spiritual Reality. As data they must be interpreted, i.e., assigned meaning, in the context of some world view or conceptual framework. The interpretive process for a given datum will, in general, include other relevant Biblical data, as well as Physical Reality data from both "soft" sciences (history, linguistics, literature, et al), and "hard sciences" (various fields of physics and biology, cosmology, archaeology, geology paleontology, anthropology, et al) to make a *consistent joint* interpretation. Some examples, implications, applications and limitations of this way of thinking about the Bible will be discussed.

Assessing Water Quality Using the Colonial Hydroid *Cordylophora*

Nadine C. Folino
Wheaton College
Wheaton, IL 60187

Assessing water quality has become increasingly important with shortages and contamination in many countries around the world. Colonial hydroids are ideal for monitoring environmental changes in aquatic habitats to assess the ecological health of a given body of water. *Cordylophora* is a colonial hydroid occurring in brackish and freshwater habitats. It is unique in that it is one of few freshwater Cnidaria; it grows optimally at 15 ppt (part per thousand) salinity. Records show that the distribution of this hydroid is expanding globally, probably enhanced by rapid boat travel and ballast discharge. *Cordylophora* is becoming more common in freshwater habitats due to changes in environmental factors of its habitat. Probably an increase in salts (chlorides) from runoff with road salt has promoted the presence of this hydroid in freshwater systems.

Currently we are documenting the distribution of *Cordylophora* populations in Hew Hampshire, Virginia and in Illinois freshwater systems. Experiments are to be conducted to test which environmental factors impact the growth and survival of *Cordylophora*. We are currently attempting to curtail hydroid growth in the filters and pipes at a local electrical station. Laboratory experiments using cultured colonies of *Cordylophora* are determining the effects of physiochemical conditions (temperature, specific conductance [salinity], oxygen concentrations, flow speed, and chloride) on the colonies of *Cordylophora*. Knowing the effect of these water quality factors (some human-induced) on the distribution of *Cordylophora* is especially valuable as we are observing an increase in invasive species in freshwater habitats.

Interpreting Creation:
A Case for Interdisciplinary Nature Study

Jeffrey K. Greenberg
Wheaton College
Wheaton, IL 60187

Ever since Adam established zoological taxonomy we have dissected knowledge of the Universe into bite-sized pieces. Modern and postmodern times in particular tend to spawn specialists and isolate them from those with similar interests but quite different educational training. Hence we have academic disciplines, subdisciplines, subsubdisciplines, etc. At its root, this reflects a more Hellenistic view of reality as opposed to a Hebrew, holistic perspective. Today it can mean that physicists and chemists need a translator to express the same thermodynamic expression in symbols the others understand, or that an anthropologist and an international economist are almost certain to arrive at opposite conclusions concerning the same data of forestry management among indigenous peoples.

Efforts to adequately analyze, diagnose and ultimately solve environmental problems are best served through a "big picture" approach, incorporating information and expertise from various pertinent disciplines. Recently, the causes of marine ecosystem degradation around southern Florida were discovered through the collaboration of researchers in ocean physics, meteorology, historical geology and hydrogeology. E.A. Shinn describes aspects of this interdependence in his article, *No Rocks, No Water, No Ecosystem* (Geotimes, Apr. 1996). As a more general example, the PBS video series, *The Birth of Europe*, show how current interpretations of political/cultural history are influenced by natural history. For example, major changes in human ecology follow regional variations in landscape and availability of natural resources.

Christians should appreciate the implications of intricate and purposeful design in

nature. Whether in the pure or more applied sciences, our investigations ought to consider the following: a) a realization of complexity and system interaction, b) a greater respect for the benefit of liberal arts education which emphasizes integrative study, and c) a reliance upon teamwork cooperation among disciplines, especially in problem solving.

Roundtable Discussion
Should Natural Science Bracket God?

Karl Willard Giberson
Hingham, MA 02043

David A. Grandy
Institute for Interdisciplinary Research
Santa Monica, CA 90405

Oskar Gruenwald
Institute for Interdisciplinary Research
Santa Monica, CA 90405

The inspiration for this Roundtable is Phillip E. Johnson's thesis in *Reason in the Balance* (1995) that methodological naturalism leads imperceptibly to, and buttresses, metaphysical naturalism that excludes the transcendent and God. Is this true or not, why or why not? Karl Giberson notes that Johnson's concept of a theistic science provides no guideposts or specifics for actually doing science which needs to be intersubjectively transmissible and empirically verifiable. For Platonists like Brigitte Dehmelt Cooper, science is but *doxa* (opinion), while true knowledge (*episteme*) arises from the application of a dialectic of distinctions which are given to us as tools and capacities to grasp reality and truth. Modern science of the brain, e.g. Roger Penrose's *Shadow of the Mind* (1994), is only beginning to explore the relationship between the brain and the mind, the physiological and the epistemic. While Paul Davies' assumption that we can know *The Mind of God* (1992) may be a bit presumptuous from the Biblical perspective, already Galileo thought that God's two books—Nature and the Word—cannot be in conflict, since both have a common author—God. This entails, *inter alia*, that science and faith are two roads to the Creator-God. David Grandy recalls that once upon a time, science and religion were perceived as complementary enterprises, with each scientific advance confirming the grandeur of the Superior Intelligence—God. Are we, then, at the threshold of a new era of fruitful dialogue between science and religion?

There is renewed interest in philosophical issues arising from the context of the natural sciences regarding the origins, nature, and destiny of man and the universe, notably complexity and design. The other side of the coin of methodological vs. metaphysical naturalism is the issue of evolution vs. creation. John Wiester rightly

calls for clarity concerning the proper definition of the “E”-word, distinguishing between micro- and macro- evolution (the former is proven; the latter is not). Most ASA members accept the prevailing scientific paradigm of an old earth, which young-earth creationists like Henry M. Morris question on both scientific and Biblical grounds. Yet, Scripture is compatible with both an old and a young earth scenario, which the Bible itself is not a science textbook but a manual for salvation and ethical living addressed not to Nature, but to *Homo sapiens* as the crown of both evolution and God's Creation.

Yet, Christians who are scientists, and who take both scholarship and faith seriously, now face a unique opportunity to relate their scientific knowledge obtained via the scientific method with the concerns and ethical guides postulated in the Bible. Michael Behe argues convincingly in *Darwin's Black Box* (1996) that at the molecular level, there is “irreducible complexity,” which could not have arisen from “self-organizing” matter alone, while Peter Rüst contends that the question of the origin of life is likely to remain beyond scientific proof, since God has hidden the answers in stochastic processes (indeterminism, degrees of freedom), thus leaving providentially room for the compelling role of faith as human choice.

On the other hand, the history of science shows that it is an open-ended process, and a never-ending quest, which defies limitations equally by theologians, philosophers, or scientists who claim that science has exhausted all the possibilities, and that there can be no further discoveries. However, Steven Meyer emphasizes the demise of the demarcation problem, implying that the natural world no longer abides or is comprehensible by the strict divisions among different disciplines. This, in turn, calls for interdisciplinary approaches and dialogue as the most credible means to advance our knowledge of God, man, and nature, as we approach the Third Millennium. Yet, the method of reductionism, so effective and even necessary, in the natural sciences is exactly the opposite of the proper methodology for the social sciences and humanities, which deals with complexity, synthesis, and different configurations of facts and values, is and ought, knowledge and faith, science and religion. How, then, can we advance the dialogue between science and religion (theology), without compromising both in the process, or advancing claims which can be fully understood or proven only within a single framework—science or religion—but not in both? In brief, can you be a methodological naturalist as a practicing scientist and still remain a metaphysical theist, that, is retain your faith in a transcendent, loving, and personal God, manifested in our Lord and Savior, Jesus Christ?

A Study of System Dynamics, Stability and Controllability
in Biological Composting Systems:
Implications for Stewardship and Warnings for Macroecosystem Stability

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Biological Composting systems are heterogeneous, aerobic, microbial decomposition systems which extract energy from biological products. Composting systems have been studied by many researchers [see Haug (1993), Walker (1994), Hoitink et al.(1993)]. Some studies (VanderGheynst, 1994, 1996) have focused on composting system dynamics, while other studies have focused on controllability and stability in biological systems of other kinds (see Hall et al (1995) for further information). A small number of studies have used empirical “control” schemes in composting systems (Oppenheimer, 1996, Regan et al, 1983) but to date there are no clear studies on controllability or stability of composting systems themselves.

A series of experiments focused on the dynamics, controllability, and stability of biological composting systems. A brief description of the results is presented, including attempts at modeling the system (see also Oppenheimer (1996), VanderGheynst (1994, 1996), Haug (1993)), perturbation of the system via changes in air flux rates, and proposed practical control algorithms which may be tested for applicability in practical agricultural and/or industrial systems.

By viewing these systems as micro-ecosystems, whose size is smaller (typically 10^{-6} to 10^0 m), and whose dynamics are much faster (“significant” changes can occur in 10^0 - 10^2 hours) than typical macroecosystems (typical sizes of 10^1 to 10^6 m, and typical dynamics of 10^0 to 10^8 hours), we can observe ecosystem dynamics including changes in biomass, energy expenditure, species number and diversity, and stability more easily than in larger macroecosystems. Use of analogy suggests both possible “control” or “stewardship” methodologies for larger ecosystems, as well as warnings relevant to modern human activities and their potential effects. Included are implications about effects of pollution, population growth, and rate of use of natural resources.

The Bible suggests a stewardship ethic, as well as a sense of humility. However, we are also told that human beings have a “special” place in God's Creation, and that they are to have “dominion” over other parts of creation (Genesis 1:26-28). As Christians, it is important to acknowledge both our power and our ignorance. The “immanent” vision of God, is revealed in part through understanding of living systems like this (see Ps 19:1, Acts 14:16-17, Romans 1:18-19, Heb 1:1). Humility and honesty are important in understanding the implications for our actions as stewards of God's Creation (see also Luke 20).

The History of Science in the Service of College-Level Liberal Arts Science
Courses: Perspectives, Resources, and Curricular Models

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This paper will provide a framework for the following questions:

- ▶ How science in various educational settings?
- ▶ How can science educators best use historical analyses of naturalism and theism in science?
- ▶ How can history create space for a Christian perspective in a secular college science course?
- ▶ What resources are available to meet the curricular needs of those attending this symposium?

As the centerpiece of our presentation, which will include demonstrations from the Internet, we will describe a two-semester Oklahoma Baptist University science curriculum project, “Science for Liberal Arts Students: An Integration of Historical, Philosophical, Cultural, and Laboratory Perspectives”. We will also provide a guide to Internet addresses at which science educators may access curriculum resources—both resources that we have authored as well as those authored by other historians of science and science educators.

Theocosmopoetry: Toward the Literary Genre of Genesis I

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The debate over the origin of the universe and life remains a contentious issue among many conservative protestants in North America. Implicated in many of the antievolutionary models is a hermeneutical program which contends that Genesis I contains substantive information that is concordant with the scientific record. The extent of the correspondence between this chapter in the Word of God and science varies widely between interpreters from the strict literalism of young earth creationism to a paltry affirmation that a notion of historical development is present.

Recasting this discussion in the light of the Hirsch-Gadamer hermeneutical debate offers a fresh approach. The failure to recognize Hirschian authorial intentionality

results in the intrusive introduction of intellectual categories from a hermeneutically distant horizon. The free reign of Gadamerian textural autonomy undermines revelatory proficiency and sufficiency. Both these tendencies invite the plethora of interpretive approaches reflected in the exegetical history of Genesis I.

A tentative solution toward appreciating the literary genre of Genesis I is proposed by underlining the threefold nature of this passage and is depicted in the neologism ‘*theocosmopoetry*’. First and foremost, Genesis I is a theology. Ontological continuity is assumed, specifically through the Imago Dei, between the Bible writer and hermeneutically distant readers. As a result, textual autonomy is restrained by its theological categories, making revelation through an ancient hermeneutical horizon possible. Second, Genesis I is also a cosmology. More specifically, it features the science of the Ancient Near East as the author intended and does not leave itself open to subsequent concordist interpretations. Finally, Genesis I has a distinct poetic structure. Poetic license is evident and points away from the historicity of the passage.

This hermeneutical approach has three advantages. First, its focus is upon the revelatory essence of Genesis I—the theology. Second, it eliminates the persistent concordist reinterpretations as science advances. Finally, it releases science to investigate freely the Scroll of God’s Works.

Giant Kelp Forests: Natural History and Human Utilization

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The giant kelp, Macrocystis, is a large brown alga that forms the most prominent marine habitat along the coast of California: the kelp forest.

Giant kelp grows attached to the bottom and has fronds that float to the surface, forming three-dimensional forests with various layers. Giant kelp forests are among the world’s most productive ecosystems, and each one is the habitat of millions of organisms comprising over a thousand species. Macrocystis forests occur along the Pacific coast of North America from Mexico to Alaska and in many localities in the subantarctic waters of the Pacific, Atlantic and Indian Oceans.

The high productivity and diversity of kelp forests have attracted a great deal of attention from humans. Macrocystis has been utilized through direct harvest for industrial gums (alginates) and animal feeds, and indirectly through the harvest of organisms that live in kelp forests. Their nearshore habitat, close to large human populations, has resulted in adverse effects by sewage, thermal effluents, and boat traffic. Fortunately, the utilitarian value of kelp forests has largely been recognized

and they are protected by various means. Understanding that these rich ecological communities bear testimony of their Creator, who wisely created for His pleasure and for our good, gives us a stronger impetus to protect these resources. Although the loss of kelp forests would result in significant economic ecological losses, the loss of irreplaceable biodiversity would be incalculable.

White-Washing Our Record?

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Professor Lynn White's 1967 paper on "the Historical Roots of our Ecological Crisis," with its view that the severance of Man from Nature in the Judeo-Christian tradition was a salient factor in the crisis, evoked a variety of responses ranging from the deep concern of an Episcopal bishop to abuse of White as an undoubted "limb of Satan."

These responses, pro and con, varied with religion and scientific discipline. But generalizing from largely Protestant reactions, at least one geography student from California State University, Northridge, discerned both unavoidable cleavages in the bedrock of thought, as well as hopeful areas of cooperation when Man and Nature are viewed in interaction. Inevitably, White's exegesis of early Genesis, along with a popular tendency to take his reading as valid, were subject to question. In Christian thinking, mankind, molded from the dust of the earth, uniquely bears the Divine image with "dominion" as a correlate. Stewardship rather than subjugation is stressed in a broader reading of Scripture. It is argued that intellectual obfuscation occurs when Man and Nature (or Creation minus man) are confused. Theological questions emerge as some seek to extend the dual Covenant of God and Man to Nature as well, especially if ecological evaluation leans toward Pantheism. If eschatological views, whether based on science or religion, are introduced, they may simply rationalize the old adage about eat, drink and be merry, for tomorrow we die—or are conveniently removed.

The Argument from Design Leads to Atheism

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The use of the Argument from Design leads to atheism. This assertion will be supported both by the use of symbolic logic and through the experience of history.

Even without using the formal logic one can appreciate the force of the assertion. For, evidence for the design of some feature in the universe (say, the origin of life) can lead to one of two conclusions. Either (1) a designer is required to explain the origin of life or (2) the origin of life occurred without a designer. For the naturalist, the second conclusion is to be preferred on the basis of Occam's razor (what is done with fewer assumption is done in vain with more). For, while the naturalist may be unable to explain the origin of life, this is preferable to having to explain the origin of the designer.

And, indeed, history confirms that the use of the Argument from Design did lead to atheism. Christians used the design evident in Newton's universe to show the intelligence of the Creator. But naturalists said that these laws were just part of the universe itself. The consequence was the atheism following the Enlightenment. Christians should, therefore, avoid using the Argument from Design.

Natural Hazards: Challenges to the Creation Mandate of Dominion?

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Natural hazards (earthquakes, volcanic eruptions, fire, floods, storms) have been understood theologically in a variety of ways. One popularly held view is that such natural events are reflections of the fallenness of the creation. As a consequence, humanity is placed in a position of conflict with nature. The creation mandate of dominion becomes a struggle to control or subjugate the forces of nature. This is expressed in attempts to defy natural forces through the application of technology. However, this view finds little support in scripture. Natural events, even destructive ones, are attributed solely to God's action. Such events are understood in scripture as expressions of God's creative power, not satanic corruptions of a previously placid creation order.

Events or processes seen as hazards or obstacles to human activity are vital parts of the created order. They are integral to the continual renewal of the Earth's land and ecosystems -- restoring the fertility of soils, maintaining ecosystem diversity, and creating vital habitat for animal and plant species. "Destructive" natural events are not processes to be fought and overcome, but aspects of God's "very good" creation to be understood and accommodated. The exercise of our divine commission to have dominion over creation must be done not in power but in humble service. This requires that we understand the dynamics of the creation over which we have been made stewards. The human suffering and property destruction resulting from natural hazards are, at least in part, consequences of our sinful self-interested use of the environment, and our failure to respect those natural

processes established by God as agents of creation's renewal.

Coal-bearing Cyclothem as Testimony of Global Change and Protracted
Geologic History

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Cyclothem are repetitive successions of strata that include sandstones, limestones, shales and coals. The Pennsylvanian System of the U. S. midcontinent is distinguished by no less than 50 individual cyclothem, many of which can be traced across thousands of km². Interpreted within an actualistic framework, cyclothem provide evidence of change in global climate and eustatic sea level 2 over long periods of geologic time. Coals are deposits of carbonized wood and plant debris, such as forming in modern peat bogs or mires. Coal beds in a typical cyclothem lie above sandstones and shales with affinities to terrestrial or fluvial-deltaic depositional environments. Shales and limestones that form above the coals contain marine invertebrates and represent deposition under subtidal marine conditions. Cyclothem represent successions of depositional environments resulting from changes in relative sea level and sediment input. The current model for cyclothem development can be summarized as follows: (a) a broad coastal plain (coal forming environment) is submerged during a rapid rise in sea level (transgression) resulting in a shallow, inland sea in which limestones and shales are deposited, (b) subsequent, but more gradual sea level fall and influx of terrestrial sediments (regression) results in the return of coastal plain conditions and the reestablishment of coal forming environments. Ancient soil horizons (paleosols) in some cyclothem can be related to humid or arid climates. If the stratigraphic successions in cyclothem are controlled by sea level fluctuations induced by the growth and decay of ice sheets, the duration represented by a cyclothem would be on the order of 200,000 to 500,000 years.

Attempts have been made to interpret cyclothem in a catastrophist (flood geology) framework. Most of the focus has been on the origin of the coals, which are interpreted as submerged peat mats that floated on the surface of the flood waters (or bark accumulations beneath floating log mats). Special attention has been given to the Kentucky no. 12 coal in the southern Illinois Basin, USA. However, limestones in the cyclothem associated with the no. 12 coal contain soil fabrics and truncated surfaces that resulted from repeated subaerial exposure, inconsistent with a flood model of deposition.

Divine Action and Quantum Locality - A Metaphorical Approach

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Many scientifically-minded Christians have concerned themselves with the issue of divine action. Specifically, scientific observations of nature, particularly concerning events such as human evolution, should have some direct connection to a divine action. But if one is to avoid appeals to the God of the gaps and/or special intervention, it is not clear that within the continuum of scientific theories we have evidence for divine action. Scholars such as Polkinghorne may suggest that the divine action comes from the laws of science, leaving the universe otherwise free to participate in the creative process. Others, such as Russell, have suggested that the realm of divine action may occur within the realm of quantum uncertainty. Here Russell depends on a popular description of quantum mechanics that is ontologically-indeterminate-one where the outcome of interactions *can not* be known. In this paper, I will follow the lead of Russell but explore the possibility of Divine action from a perspective of a local *and* deterministic description of quantum mechanics. Because practical applications of these quantum descriptions may be difficult to visualize, the story of an indeterminate and local quantum world will be told as a metaphor, through the eyes of an ant named Julie.

Assessing Alternative Explanations for the
Apparent Fine Tuning of Natural Law

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If the basic physical constants were slightly different from what they are, then nothing like life would be possible. There are reasons for thinking that the preceding proposition is true. However, granting its truth does not itself imply that there is a cosmic designer. Alternative responses are possible:

1. We would not be here were it otherwise, so no explanation is needed.
2. There is only one logically possible way natural law could be constituted.
3. Beyond our visible universe the basic physical constants vary. That we are in a region which permits intelligent life is an observational truism.
4. There is an impersonal ordering principle.
5. There is a cosmic designer. How does one assess these alternatives?

This paper will consider the pertinent questions which must be asked and will point

out a number of the theoretical difficulties connected with the various proposals. Noticing these difficulties, however, does not tell one how much weight to give to them. In the end, how one assesses the options is strongly influenced by whether they comport with the metaphysical outlook which one brings to the issue. The paper concludes with some reflections on the status of the design argument as viewed from the perspective of the apparent fine tuning of natural law.

Can God's Final Judgment Be Redemptive?

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The purpose of this paper is to promote better understanding between the scientific and Christian communities by suggesting an alternate scriptural interpretation to the orthodox doctrine of "eternal torment". To many scientists, including Charles Darwin, this doctrine of eternal or unending punishment of the wicked has been a real roadblock to further examination of Christianity, since they maintain there is a logical contradiction between a God of love and a God who would let much of mankind suffer forever. In order to provide an alternate, yet scriptural position, this paper will critically examine the words *olam* in the Old Testament and the words *eon* and *eonion* in the New Testament. This should provide the basis for an alternate way of interpreting the duration of punishment by demonstrating that these words often are used to denote indefinite or limited periods of time. Thus the punishment resulting from God's final judgment could serve a useful purpose in God's plan and program for his created world.

This subject is admittedly a touchy one for many Christians. Yet the goal of communicating with many in the academic community who otherwise might not be reached seems to make the effort worthwhile, especially if the integrity of the scriptures can be maintained in the process. This approach of examining the duration of punishment with the hope of demonstrating that it might be purposive could provide an alternate position which will help in promoting constructive dialogue between the scientific and Christian communities.

The Big Bang of Life

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Dr. Hugh Ross pointed out in his book "*The Fingerprint of God*" that the big bang

and other features of the cosmos demonstrate the presence of a creator. Apart from the initial creation, the subsequent formation of galaxies and solar systems, and even the appearance of our own earth can be explained by natural law.

Whether life arose by natural law, however, is a point of modern contention. Neo-Darwinists adhere to the purely natural synthetic theory of life, but the theory is on rocky ground because it does not fit the data. Molecules do not randomly combine to form life, and mutations are inadequate raw material to form new species. Nor does the pattern of appearance of new forms of life as shown in the fossil record fit the theory. But the theory persists for lack of a better substitute.

A parallel can be drawn between a new theory of life, the DeHaan theory of MacroDevelopment (*Perspectives on Science and Christian Faith* 48, no. 3) and what Ross said about the cosmos. The theory of MacroDevelopment allows for the appearance of new forms of life from the old by purely natural mechanisms, and the necessary act of special creation of life was so very long ago, that this time could be described as "in the beginning". Just as the planets form by natural law, so also do species come from other species by natural law, and by divine design.

Mechanisms of Creation in Biology

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The origin of life, biological species, and individuals is addressed from the viewpoints of both natural science and Bible exegesis. Full compatibility of a plenary inspirational view of the Bible with the scientific facts is assumed, and a harmonious interpretation of reality is sought.

The theory of evolution attempts to provide a comprehensive explanation of biology on a large time-scale. Microevolution is not in doubt. Mutations provide variant individuals, which are then subject to natural selection. The possibility of spontaneous constructive macroevolution, however, remains questionable. I define macroevolution as the emergence of fundamentally novel functionality, requiring an advance specification of information. For atheism, extremely improbable coincidences are implied, for theism, design. With the origin of life, the same problem obtains cumulatively.

God's creative activity cannot be limited to "interventions", as all natural processes are equally under his creative control. Creation and "emergence" are complementary descriptions in different dimensions. For at least part of the history of the universe, creatures (fallen angels, later humans) have destructively interfered.

Cleanly attributing biological features to either creation or destruction may occasionally be difficult. Creation by a seemingly spontaneous origin of life and macroevolution is feasible. It eliminates informational problems. Dichotomous models such as "recent creationism", "gap theory", "intermittent creationism", and "functional integrity" of created matter at the time of the big bang are inadequate.

Extrasolar Planets Around Sunlike Stars

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One of the most important discoveries of 1996 was the first clear evidence for extrasolar planets orbiting several sunlike stars. Announcements were made of at least eight planets around nearby stars, leading some to suggest an increased possibility of extraterrestrial life among the billions of stars in our galaxy. A closer examination of the evidence, however, reveals unusual properties for most of these new planets that appear to preclude the possibility of most forms of life.

Most of the recently discovered extrasolar planets were detected from Doppler shifts in the light from their host stars caused by planet-induced wobbling. In one survey of 120 sunlike stars, six planets were detected, all of Jupiter size or larger. Most of these planets were much closer to their host stars than the habitable zone of an earthlike planet, making it very unlikely that the conditions for life could be met even if smaller planets orbit beyond these giant planets. This evidence suggests that earthlike planets capable of sustaining life require a highly improbable arrangement of planets around a sunlike star, revealing that the earth may be a rare exception to the rule for typical planets.

The Future Interface of Science and Christianity

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Predicting what the future holds 50, 100 or even 200 years in advance is not our normal preoccupation as scientists. However some of us are called to bring science into the forecasting arena when concerns arise over the future human impact of fossil fuels, mineral resources, water, waste, natural hazards, and disease. For example, legitimate fears of global warming are driving serious international attempts at understanding the global cycle in order to predict quantitatively the

climatic effects of increased CO₂ emissions over the next 100 or 200 years. The goal is informing and guiding public policy in such a way that we avoid future disasters. Similarly, predicting the next 100-200 years of science, Christianity and their common interface is not our normal preoccupation as Christians in science. But the disastrous historic controversies surrounding science and Christianity suggests that we in the Church would do well to collectively consider with similar rigor what the future may hold, with the goal of avoiding future disasters.

The issue of global warming is a good analogy, in that it is not just a complex issue in science; it also involves predicting future human behavior, including technology, economics, and politics. Furthermore, being right on the technical details is not sufficient; to shape public policy, a technical consensus must be arrived at and be made acceptable in a politically effective way. By analogy, if the members of the ASA and other Christians in science had had a clearer understanding in 1947 of what the future would hold and why, vis-a-vis the interface of science and Christianity, could they have effectively steered the future in a somewhat different course? It seems probable that Larry Kulp's understanding of the technical issues of radiometric dating, but the lack of understanding of the dynamics of conservative Christianity, directly contributed to the rise of Creation Science. A godly consensus was not built among conservative Christians.

There is a question as to whether or not the creationist controversies of the late 20th century were merely a flash in the pan, dying out with this generation of protagonists, or will such conflicts be the norm for the next 200 years? A significant potential for continued conflict in some form exists for the fundamental reason that the modernist controversy has never been satisfactorily resolved within the Church. For example, there is no widely accepted Biblical theology of Nature—acceptable at the pastoral level—that this is simultaneously fully orthodox science and fully orthodox Christianity. Liberal Christianity has embraced science at the cost of orthodoxy, whereas the orthodox have tended to embrace unorthodox views of Nature.

If orthodox Christian intellectuals could craft with some wisdom a clear statement or vision of what the future (say, the next 100 to 200 years) holds and why—vis a vis science, Christianity and their common interface—it may be useful, and not just as an exercise, because if done with godly collectivism it may shape that future purposefully. Surely such an exercise would modify and clarify our collective vision of present and past conflicts and cause us to probe more deeply into the nature of science and the Universe on the one hand and into the nature of the Church, history and Christian knowledge and experience on the other. Such an exercise is very difficult; for example looking over our shoulder at the events since 1797 warns us of the enormous changes two centuries can bring. Geology was born just 200 years ago. Nevertheless, such a cross-disciplinary project need not degenerate into unbounded speculation nor produce conclusions that solely depend

on value-laden presuppositions. Correction conclusions must mirror reality. The future of science and Christianity is broadly constrained by very basic contingent properties of the Universe and how we are able to learn about it on the one hand and of God and how we can know him and his purposes and activities on the other. This paper attempts to sketch a few of the more important constraints on the probable future of science and the Church on the 100 to 200 year timescale and offers several end-member scenarios on where the interface of science and Christianity may be headed.

Story, Planet Earth, and the Paradigm of Magma-Metal Series

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Geology is more than the study of planet earth—it is reading a story written in the rocks by God. It is art appreciation. The wonder geologists experience through the story and art is worship. The greater the geologist's reading ability and passion for the story the deeper the worship. During the last century modern geology has drifted, as have other sciences, in a reductionistic direction, impoverishing it's soul. Story has been lost to specialization, the fetish of rationalism. Science is now "fragmented into little islands of near conformity surrounded by interdisciplinary oceans of ignorance" (Ziman, 1996). Magma-Metal Series is a new classification tool developed for the purpose of reading the story better and sailing the "oceans between the islands". The fundamental paradigmatic parameter around which the classification revolves is the notion of magma series: a cogenetic suite of igneous rocks that have differentiated along a mafic to felsic line of liquid descent from and controlled by the silicate, volatile, and metal composition of a more mafic parent magma. From it a mantle model of seven compositional layers has been constructed with seminal implications for the geology of planet earth. For example, plate tectonics is an overarching model that can be used for understanding how geologic orogens develop along convergent margins, but it frustrates geologists who attempt to apply it in predictive or detailed ways to the geology of a particular region. By itself plate tectonics does not really tell the story. Magma-Metal Series offers plate tectonics a critical missing link: the casual connection of igneous rocks to geotectonics in a concise time and space context. Geologic data are like words and plate tectonic models are chapter outlines. Magma-Metal Series links the words together into sentences so that story can be read better and connected to the story that transcends science.

The Theology of Creation and Legitimacy of Science: Issues Underlying "Naturalism" and "Creationism" as Paradigms

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It is argued that some current attacks on the legitimacy of "naturalism" as a necessary presupposition of science are theologically misguided. Although a radical philosophical naturalism is secularism's way of excluding God from the universe, constructive Christian thinking should not be based on reaction to such errors. Historically, scientific enterprise was given legitimacy by such Christian pioneers as Robert Boyle precisely because its naturalistic methodological assumptions served to limit its claims and mark it off as a discourse distinct from, and given essential context by theology. Reasons for that decision are rooted in the theology of creation and deserve serious reconsiderations. This is especially necessary today as science tries to address questions about the natural world lying beyond the scope of physical theory.

Theological grounds for science emerge from a properly framed theology of creation and the biblical creation narratives forming its basis. God's sovereign transcendence is central to these narratives; that creation shows the mark of a divine mind or embodies divinely ordained purpose are subsidiary truths. Scope and meanings of terms like "naturalism" and "creationism" must be worked out in that context. In particular, naturalism and the scientific enterprise it defines are a theologically legitimate way to consider aspects of God's creation within their own authentic, contingent and creaturely terms of reference—not an attempt to discern the divine nature or character. On the other hand, the scope of such a "naturalism" is much more open, certainly not limited to materialist or reductionist conceptions of nature.

Are Truth Claims in Science Socially Constructed?

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In a prize-winning book of essays entitled *Golem: What Everyone Should Know About Science*, (Cambridge University Press, 1993) sociologists Collins and Pinch claim that the establishment of scientific truth is a cultural process rather than the consequence of the accumulation of facts about the natural world. The post-modern credo is that neither reason nor revelation gives us objective truth. Even truth claims in science are socially constructed by producing agreement among experts. The positive aspect of this approach to science is its refusal to champion the triumphalism of "scientific fundamentalism". Post-modernism however, becomes

pernicious when it leads to the conclusion that objective truth in science is a cultural artifact.

In most cases understanding of natural phenomena has become too uncertain to frame a clear-cut test, our interpretation of experiments depends strongly on the conceptual context in which they were designed, and our data are often ambiguous and susceptible to a wide range of explanations. To complicate matters further, normal science often suppresses novelties because they are subversive to tradition-bound activity (Kuhn: *The Structure of Scientific Revolution*, 1962). Examples will be cited from the physical sciences to illustrate the dilemma. It will be shown however, that given the complexity of nature, especially in space physics and cosmology, scientists are looking more and more for a 'multiplicity of strands of evidence', many of them weak and ambiguous, but woven together, they make a coherent logical bond whose strength is enormous. Finally, it will be shown that the same argument can also be made for the truth claims of Christianity.

Organic and Theoretical Evolution: Fact, Fantasy, Fraud

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The apparent conflict in the culture between supposedly opposing descriptions of the origination of the cosmos and the development of its flora and fauna has three effects:

1. It separates scientists and religious persons into two camps, with considerable aggressive interrelations.
2. It influences developing young people with an artificial stress at critical times in their education, causing not only distress and anxiety but forcing them to choose between two styles of life, often to the destruction of their intellectual and moral values.
3. It handicaps the scientists with little moral base for his/her beliefs and it handicaps the lay person with distrust of the most efficient way of discovering facts about the universe and developing technology.

The cause of the disharmony lies within the thinking of both camps, and has to be resolved by honest, open, reasonable exchange of information, with neither surrendering, but coming to harmonious conclusions. This paper will explore the roots of scientific development which opens the way to harmony between the religious and the scientific.

The Nurseries of Stars: Studying God's Continued Creativity in the Universe

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"Give thanks to the Lord,... who by his understanding made the heavens. His love endures forever." (Psalm 136) The creation of stars similar to the sun continues even today. Astronomers are observing amazing stages of stellar birth which include the collapse of giant gas clouds, the formation of disks of material around stars from which planets may form, fountains of material ejected from these regions at high velocity, and bright colorful nebulae lit up by the young stars.

I will present some of the newest images from the Hubble Space Telescope and from radio telescopes which show us the activity in the nurseries of stars with unprecedented detail. By studying the heavens we learn that the Universe God created is not stagnant but is dynamic, and the act of Creation continues under the physical laws He has established.

I will also mention some brief and simple facts of astronomy which can be used to reach out to churches in a non-threatening way, showing how the Universe has been sculpted over billions of years, and thus helping in the understanding of Genesis and also hopefully fueling interest in the excitement of scientific investigation.

Paradigm Shifts in Geology and Biology: Geosynclinal Theory and Plate Tectonics; Darwinism and Intelligent Design

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Geosynclinal theory and the hypothesis of continental drift (the precursor to plate tectonics) were both proposed within one year of 1859, the year Darwin's theory of natural selection was proposed to replace the prevailing theory that life was intelligently designed. Over the next 100 years, both Darwin's theory of evolution by means of natural selection and the origin of mountains ranges by means of geosynclinal theory displaced their rivals of intelligent design and continental drift. This was in spite of the fact that by 1930, and especially by 1950, there was substantial evidence that the continents had once been together in a supercontinent and had subsequently drifted to their present positions.

In 1960, the textbook Geological Evolution of North America, conflated the universal acceptance and unifying sub-disciplinary role in geology of geosynclinal theory with the solid status and unifying role in biology played by Darwin's theory of evolution by means of natural selection. Five years later geosynclinal theory was replaced by the theory of plate tectonics, and it was realized that geosynclinal theory had never possessed a satisfactory explanatory mechanism for explaining the origin of the world's major mountain ranges. Examining the reasons for overconfidence in the explanatory power of geosynclinal theory may have important lessons in humility for those insisting that undirected, neo-Darwinian mechanisms have explained the origin of major innovations in the history of life.

Consideration of the hypothesis of intelligent design might serve the important function of focusing our attention on whether Darwinian mechanisms have explained the origin of complexity.

"Discoveries of Seafloor Exploration"

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Please join me in marveling and rejoicing over a God who is the author of both creation and science. This talk will reflect on the many wonders that God has created in the deep-sea realm, wonders that have only recently been discovered by marine geologists in the last 10-20 years. The deep ocean remains a largely unexplored frontier. NASA's Magellan spacecraft has imaged and mapped 99% percent of the surface of Venus in enough detail to reveal topographic features on the order of 50 m in height. However, ~90% of the Earth's deep ocean floor has yet to be surveyed in the same detail. However rapidly developing technologies such as swath mapping, satellite altimetry and global positioning systems now provide an ability to map that remaining 90% over a broad spectrum of scales. Today's technological wonders are indeed impressive. One of the greatest *intellectual* developments to come along in recent years has been the theory of plate tectonics, which has focused much of its attention on a 70,000 km-long chain of underwater mountains which "wraps itself around the globe like the seam on a baseball." This feature is often referred to as the global mid-ocean ridge, and it is easily the largest geological feature on the face of the Earth. Over the past 200 million years, if not throughout most of geologic time, the ocean floor has been torn apart and created anew along the mid-ocean ridge at spreading rates of 1 to 17 cm/yr. As a result, the mid-ocean ridge is the site of numerous

volcanic eruptions, earthquakes, and hydrothermal vents, the deep-sea equivalent of terrestrial hot springs. I will take you on a side show tour of this region of God's creation highlighting recent discoveries made on the East Pacific Rise at depths of 2500-3000 m.

The Wisdom of God in the Range of Light

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Because the wisdom and glory of God are revealed in creation moment by moment, that is, historically, and are mediated through created agents such as wind, ice, thunderstorms, volcanoes, and earthquakes, we can glimpse aspects of God's wisdom through the exploration of geological history. This paper examines the manifestation of the wisdom of God in the geological history of John Muir's Range of Light, the Sierra Nevada Mountains of California.

In the Sierras, God's wisdom is displayed in the artifacts of an extremely complex series of geological events that began with deposition of thick sequences of fossiliferous marine sediments throughout the Paleozoic and early Mesozoic Eras. Sedimentation was interrupted by episodes of mountain building. During the Mesozoic Era, the sedimentary rock sequences were intruded by a series of magmas that formed the plutons of the Sierra Nevada batholith now so beautifully exposed in Yosemite, Kings Canyon, and Sequoia National Parks. The sedimentary rocks are preserved as roof pendants throughout the batholith. Subsequent to uplift and severe erosion of the batholith, new sediments were deposited upon its deeply weathered surface and themselves eroded. Goldbearing gravels filled Early Cenozoic river channels cut into these eroded sedimentary rocks. Then followed widespread eruptions of volcanics interbedded with more gravels. Lastly, the entire region was uplifted, tilted toward the west, and extensively glaciated during several episodes culminating in the Wisconsin glaciation only a few thousands of years ago.

Intelligent Design Theory: An Argument for Biotic Laws

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In the last few years proponents of intelligent design theory (M. Behe, P. Nelson,

W. Dembski, S. Meyer, et al) have made valuable contributions in providing a thoughtful critique of philosophical and methodological naturalism. The application of an explanatory filter is useful in pointing out that many biological phenomena are inexplicable by physical and chemical laws or by chance. But the assertion that the explanation of such phenomena must be attributed to intelligent design implies the acceptance of a reductionist ontology. Intelligent design is basically presented as the causal agent for phenomena which are not law governed. M. Behe, in particular, has presented a strong case for irreducibly complex systems whose existence can not be explained very well, if at all, by only physical-chemical laws or by chance.

This kind of analysis, however, assumes a reductionist view of laws as well as of design. Are design and laws exclusive forms of explanation of reality? A strong argument could certainly be made that chemical structures reveal evidence of intelligent design. And are biological phenomena not also law governed? In other words, the evidence for intelligent design as the casual agent or explanation for irreducibly complex biological systems is really evidence for laws for modes of reality beyond merely chemical/physical reality. We need to recognize that reality displays multiple modes of being each of which are governed by laws for that mode of being. The further recognition, as H. Dooyeweerd argued in his theory of the cosmonomic idea, of law as the boundary between God and his creation also provides the basis for the design that is so evident in reality.