The Heavens Declare the Glory of God

58th Annual Meeting of the American Scientific Affiliation

Colorado Christian University
Lakewood, Colorado
July 25–28, 2003

Plenary speakers:

Dr. Dennis Danielson
Department of English
University of British Columbia
Vancouver, BC Canada

Dr. Deborah Haarsma
Department of Physics and Astronomy
Calvin College
Grand Rapids, MI

Dr. William Keel
Department of Physics and Astronomy
University of Alabama
Tuscaloosa, AL

Dr. Alan Stockton
Institute of Astronomy
University of Hawaii
Honolulu, HI

Dr. Eilene Theilig
Galileo Millennium Mission
NASA Jet Propulsion Laboratory
Pasadena, CA

Program Contents

General Information

2003 ASA Annual Meeting Schedule

Presenters

*Student or early career scientists presenting a paper or poster through donated scholarships.

Local Areas Fellowship Luncheon

*Student or early career scientists presenting a paper or poster through donated scholarships.

General Information

Bookstore

The Colorado Christian University bookstore located in the Student Center, "E" on the campus map has extended its regular summer business hours for us. It will feature books of interest to our attendees. Bookstore hours are:

Monday–Thursday:	9:00 AM–5:00 PM
Friday:	9:00 AM–7:30 PM
Saturday:	10:00 AM–2:00 PM
Sunday:	Closed

Emergency Phone Number

If someone needs to contact you, they may call Colorado Christian University at the following number: **303.963.3222**

Plenary Sessions

Friday, 7:30 PM:	"A Universe of Wonder" –Deborah Haarsma
Saturday, 9:00 AM:	"Watching Galaxies Form Near the Beginning of Time" –William Keel and Alan Stockton
Saturday, 7:30 PM:	"Copernicus and the Tale of the Pale Blue Dot" –Dennis Danielson
Sunday, 7:30 PM:	"The Magnificent Worlds of Jupiter" –Eilene Theilig

Special Meetings

Friday:	9:00 PM:	Welcome Mixer
Saturday:	7:00 AM:	Publications Breakfast
	12:15 AM:	Fellows Luncheon
	12:15 PM:	Student and Early Career Scientists Luncheon
	9:00 PM:	Affiliation Meetings
	10:00 PM:	Student and Early Career Scientists Ice Cream Social
Sunday:	11:30 AM:	Local Areas Fellowship Luncheon
	5:15 PM:	Women in Science/Technology Dinner
	9:00 PM:	Commission Meetings
Monday:	11:15 AM:	"Outreach and Service to the Church" –Hugh Ross
		"ASA in the 21st Century: How to Expand our Vision for Serving the Lord in Science" –Ken Touryan

Many thanks to …

our program chair **Jennifer Wiseman** and our local arrangements chair **David Oakley** for the countless hours they have devoted to developing this program.

We are especially pleased and thankful that the **John Templeton Foundation** has helped fund the Student and Early Career Scientists' scholarships and our plenary lecturers: Dennis Danielson, Deborah Haarsma, William Keel, Alan Stockton, and Eilene Theilig.

The American Scientific Affiliation encourages thoughtful and provocative scientific presentations and discussions. Presenters and discussants are expected to maintain a humble and loving attitude toward individuals who have a different opinion.

2003 ASA Annual Meeting Schedule

	Friday, July 25, 2003		
7:00–8:00 AM	Breakfast –Dining Commons, “C” on campus map		
9:00 AM	Field trips: Leave from the parking lot by the Field House, “B” on campus map #1 –The Earth Has a History #2 –High Altitude Ecology #3 –National Center for Atmospheric Research		
10:00 AM–7:00 PM	Registration –Harwood 125, “I” on campus map		
11:30 AM–12:30 PM	Lunch –Dining Commons, “C” on campus map		
12:30 PM	Field trips: Leave from the parking lot by the Field House, “B” on campus map #4 –National Renewable Energy Laboratory #5 –Red Rocks - Dinosaur Ridge		
6:00–7:00 PM	Dinner –Dining Commons, “C” on campus map		
7:30–9:00 PM Plenary Session	Welcome and Announcements –Music Center ASA President: **Ken Touryan** Local Arrangements Chair: **David Oakley** Program Chair: **Jennifer Wiseman** “A Universe of Wonder” –**Deborah Haarsma**		
9:00 PM	Welcome Mixer –Music Center		
Please note:	All meal time meetings begin at the start of the meal time. Please go through the line promptly and then take your meal with you to the meeting table.		
	Saturday, July 26, 2003		
7:00–8:00 AM	Breakfast –Dining Commons, “C” on campus map	Publications breakfast meeting –**Roman Miller**, presiding	
8:30 AM	Morning Devotions –Music Center Music Leader: **Russ Camp** Devotional Leader: **Caroline Berry** Announcements: **David Oakley** and **Jennifer Wiseman**		
9:00 AM	Spouse Field Trip: Leave from the parking lot by the Field House, “B” on campus map #6 –Betty Ford Alpine Gardens		
9:00–10:15 AM Plenary Session	Music Center Introduction: **Jennifer Wiseman** “Watching Galaxies Form Near the Beginning of Time” –**William Keel** and **Alan Stockton**		
10:30 AM	Refreshment Break –Tent		
11:00 AM–12:15 PM Parallel Session I	Room: W. Annex, “C” on map Chair: **Joseph Spradley** **A. Introduction to Cosmology** ◆A Layperson’s Introduction to the Big Bang –**Perry Phillips** (45 min.) ◆Chiasmic Cosmology and Scientific Cosmologies –**George Murphy**	Room: Beckman 101, “A” on map Chair: **Jack Swearengen** **B. Cosmology in Scripture** ◆The Cosmology of Genesis One –**William Monsma** ◆A Scriptural Star Trek? –**William Traugott** ◆Objections to Planetary Conjunction Hypotheses for the Identity of the Star of the Magi –**Sherman Kanagy II**	Room: E. Annex, “C” on map Chair: **Richard Wright** **C. Environmental Stewardship** ◆Christian Environmentalists: A Political Force To Be Reckoned With –**Mike Hingle** ◆Freshwater Mollusks: A Part of Creation in Dire Need of Care –**David Campbell** ◆A Biological Integrity Assessment of the Conewago and Codorus Watersheds –**Michael Burrell**
12:15–1:15 PM	Lunch	Fellows Luncheon –**Don Munro** and **Ken Touryan**, presiding	Student and Early Career Scientists Luncheon –**Susan Daniels** and **Johnny Lin**, presiding

1:25–3:30 PM Parallel Session II	Room: W. Annex, "C" on map Chair: **Owen Gingerich** **A. Discoveries in Cosmology: New Theories, New Questions** ◆Nothing New under the Sun: An Analysis of Steinhardt and Turok's Cyclic Universe Model –**Brian Thomas** ◆Now that I've Seen Everything, So What? –**Paul Arveson** ◆Cosmological Darwinism and Its Discontents –**Robert Mann** ◆Superstring Cosmology: God's Blueprint for the Universe –**Gerald Cleaver** ◆Does the Big Bang Strongly Support Creation *Ex Nihilo*? –**James Brian Pitts**	Room: Beckman 101, "A" on map Chair: **Perry Phillips** **B. Divine Action in Nature** *–Special Session, sponsored by Creation Commission* ◆Two Modes of Divine Action in History –**Craig Rusbult** ◆Give Me Some of that Old-Time Theology: A Reflection on Charles Hodge's Discussion of Concursus in Light of Recent Discussions of Divine Action in Nature –**Terry Gray** ◆A Geometric Basis for Divine Action in the World –**Frank Roberts** ◆Fine-Tuning in the Universe –**David Wilcox** ◆Where Do the Angels (et al.) Fit In? –**Robert Newman**	Room: E. Annex, "C" on map Chair: **John Wood** **C. Bioethics and Stewardship** *–Special Session, sponsored by Bioethics Commission and Global Resources and Environment Commission* ◆Biogeographic and Trophic Restructuring of the Biosphere: The Earth Under Human Domination –**Cal DeWitt** ◆Human Population Growth and Control: Religious and Ethical Challenges –**Hessel Bouma III** ◆Global Climate Change: A Defining Issue for the 21st Century –**Richard Wright** ◆Biotechnology as Restoration: Can We Feed Ten Billion People *and* Protect Ecosystem Integrity? –**David Koetje**
3:30 PM	Refreshment Break –Tent		
4:00–5:45 PM Parallel Session III 5:15–5:45 PM Parallel Session III-D	Room: W. Annex, "C" on map Chair: **Owen Gingerich** **A. Cosmology,** continued ◆Panel Discussion: How Do We Understand the New Cosmological Models in Light of our Faith? **D. Basic Principles of Writing** ◆Writing That Connects –**Jim Ruark**	Room: Beckman 101, "A" on map Chair: **Robert Newman** **B. Divine Action in Nature,** continued ◆The Order of Nature, Human History, and Natural History –**Peter Payne** ◆Divine Action in Nature: Visible Only through Faith –**Larry Olsen** ◆Dimensions of the Human Being and of Divine Action –**Peter Rüst** ◆Group Discussion	Room: E. Annex, "C" on map Chair: **Hessel Bouma III** **C. Bioethics and Stewardship,** continued ◆Biotechnology and Food Security: The Ethics of Gene Power –**Uko Zylstra** ◆The Environmental Litany: Do We Worry Too Much? –**John Wood** ◆Group Discussion
6:00 PM	Picnic under the Stars! (under the tent, actually)		
7:15 PM	Lay Education Project Video –Tent		
7:30–8:45 PM Plenary Session	Tent Introduction: **Jennifer Wiseman** "Copernicus and the Tale of the Pale Blue Dot" –**Dennis Danielson**		
9:00 PM	Affiliation Meetings ◆Christian Biologists: **Marilyne Flora**, presiding –Room: W. Annex, "C" on map ◆Christian Geologists: **Keith Miller**, presiding –Room: Beckman 101, "A" on map ◆Christian Engineers and Scientists in Technology: **Bill Yoder**, presiding –Room: E. Annex, "C" on map		
10:00 PM	Student and Early Career Scientists Ice Cream Social –Tent		
Please note:	For the Sunday luncheon, find the table marked with the number of your local area (see p. 32) at 11:30 AM to meet and fellowship with others from your area. The serving line starts at noon.		
	Sunday, July 27, 2003		
7:30–8:30 AM	Breakfast –Dining Commons, "C" on campus map		
9:00–9:45 AM Bible Study	Tent Title: "Studying the Created Order with Consecrated Bodies and Renewed Minds," Scripture: Rom. 12:1–2; 2 Cor. 2:14–17 –**Dorothy Chappell** Announcements – **David Oakley** and **Jennifer Wiseman**		
10:00–11:15 AM Worship Service	Tent Music Leader: **Russ Camp** Worship Leader –**Fred Hickernell** Sermon: "There's Splendor, and Then There's *SPLENDOR*," Scripture: Heb. 1:1–3 –**Terry Morrison**		
11:30 AM	Local Areas Fellowship Luncheon –Dining Commons, "C" on campus map		

1:00–3:15 PM Parallel Session IV	Room: Academic West 4, "G" on map Chair: **Michael Keas** **A. Is Earth a Privileged Planet?** *–Special Session* ◆Historical Interlude: The Great Copernican Cliché **–Dennis Danielson** ◆The Privileged Planet: How Our Place in the Cosmos is Designed for Discovery **–Guillermo Gonzalez** and **Jay Richards** ◆Critique of the Privileged Planet Hypothesis **–Kyler Kuehn** ◆Teaching the Significance-of-Earth Controversy in Science and Liberal Arts Courses **–Michael Keas** ◆Panel Discussion	Room: Beckman 101, "A" on map Chair: **Robert Mann** **B. Cosmology in History** ◆The Divinity of the Starry Heavens and the Origin of the Copernican Revolution **–Thomas McLaughlin** ◆Kepler: Astronomy from the Eyes of Faith **–Owen Gingerich** ◆Galileo the Theologian: Hermeneutical Insights for Today **–Denis Lamoureux** ◆The Martian Fossil Controversy: Theological Implications from an Earthly Parallel **–Robert Geddes**	Room: E. Annex, "C" on map Chair: **Susan Daniels** **C. Life Science: Biology, Health, and Ethics** ◆An Evaluation of Some Religious Perspectives on Stem Cell Research **–Kristyn Mannoia** ◆The Pestilence Walking in Darkness: Science and Ethics of Vaccination Policy **–Kenneth Carter, Jr.** ◆Entropy, Information, and the Origin of Life **–Walter Bradley** ◆PCR Detection of *Plasmodium falciparum* Strains and Their Relationship to the Severity of Malaria **–Jill Colabroy** ◆The Effects of Bt Corn Pollen on Green Lacewing (*Chrysoperla carnea*) Longevity, Survivability, and Fecundity **–Rachel Gallusser** ◆Walking and Talking: Physical, Social, and Spiritual Benefits **–Fred and Thresa Hickernell**	Room: W. Annex, "C" on map Chair: **Jennifer Wiseman** **D. Our Science and Faith at Work and Church: Engaging the Campus** *–Special Session* ◆The Cambrian Explosion, the Intelligent Design Movement, and the Rising Challenge to Biology Education **–Richard Aulie** ◆Resolving Modern Anti-Evolutionary Creationism into Two Distinct Movements **–Josh Abraham** ◆Teaching Honors Level Philosophy of Science/Origins Science in a Christian Environment **–William Collier** ◆Science as a Calling and an Issue: Presenting Science and Faith at Church and at a Campus Fellowship **–David Campbell** ◆Relativism and Engineering Education **–William Jordan** ◆Talking about God with Scientists **–Loren Haarsma** ◆Roundtable Discussion
3:15 PM	Refreshment Break –Tent			
3:30–5:00 PM Poster Session	◆Galaxy Interactions and the Origin of Quasars **–Gabriela Canalizo** ◆A Lightless Precursor to the Observable Universe: Genesis 1:3 **–William Foulks, Jr.**, presented by **Brett Smith** ◆From Giant Nebular to Globular Clusters **–Jesús Maíz-Apellániz** ◆Sensitive Very Long Baseline Interferometric Measurements of Interacting/Merging Galaxies **–Emmanuel Momjian** ◆Solution of Physics Puzzles Using Double-Universe Symmetries **–Lawrence Starkey** ◆The Dynamics of Current Star Formation **–Jennifer Wiseman** ◆Applying God's Message in Nature **–Thomas Ingebritsen** ◆The Glorious Liberty of the Children of God **–Charles Kennedy, Sr.** ◆A Mechanical-Engineering Analysis of the Early Earth and the Days of Creation **–Walter Starkey** ◆Genesis One as a Sign of the Evolutionary Record: Art and Implications **–J. Raymond Zimmer** ◆Genomic Tricks **–Carl Resler** ◆Evidence for Design in the Human Body **–Kristen Stoermer** ◆Origins and Designs **–Donald Strombeck** ◆Teaching Courses on Astronomy, Science, and Faith Issues for Lay Audiences (Both Believers and Skeptics) **–Gladys Vieira** ◆Regulation of the Cell Cycle by the Anaphase-Promoting Complex (APC) **–Joshua Bembenek** ◆Implications of Cell Death in the Generation of Auto-Immune Responses **–Michelle Harris** ◆Selection and Analysis of Escape Variant Mutations Affecting Epitope IV of the Simian Virus 40 Large Tumor Antigen **–Anuj Kalsy** ◆Selection and Analysis of Escape Variant Mutations Affecting Epitope I of the Simian Virus 40 Large Tumor Antigen **–Alexandra M. Smith**		
5:15–6:15 PM	Dinner –Dining Commons, "C" on campus map		Women in Science/Technology Dinner **–Debbie Haarsma**, presiding	

6:30–7:30 PM	ASA Business Meeting –Tent			
7:30–8:45 PM Plenary Session	Tent Introduction: **Jennifer Wiseman** "The Magnificent Worlds of Jupiter" –**Eilene Theilig**			
9:00 PM	Commission Meetings ◆Bioethics: **Don Munro**, presiding –Room: Academic West 4, "G" on map ◆Communications: **Paul Arveson,** presiding –Room: E. Annex, "C" on map ◆Creation: **Robert Newman**, presiding –Room: W. Annex, "C" on map ◆Global Resources and Environment: **John Wood**, presiding –Room: Beckman 101, "A" on map ◆History and Philosophy of Science: **Michael Keas**, presiding –Room: Beckman 207, "A" on map ◆Physical Sciences: **Lloyd Davis**, presiding –Room: Academic West 1, "G" on map ◆Science Education: **Craig Rusbult**, presiding –Room: Beckman 213, "A" on map ◆Social Sciences: **Judy Toronchuk**, presiding –Room: Academic West 5, "G" on map			
	Monday, July 28, 2003			
7:00–8:00 AM	Breakfast –Dining Commons, "C" on campus map			
8:15–8:45 AM	Morning Devotions –Tent Music Leader: **Russ Camp** Devotional Leader: **Kenneth Dormer** Announcements: **David Oakley** and **Jennifer Wiseman**			
9:00–10:45 AM Parallel Session V	Room: Academic West 4, "G" on map Chair: **Paul Arveson** **A. Astronomy Research at the Cutting Edge** ◆Observing the Evolution of Stars like the Sun –**Bruce Hrivnak** ◆The Dynamics of the Oort Comet Cloud, with Impact on Terrestrial History –**Lawrence Molnar** ◆Dark Matter in Galaxies –**Aaron Romanowsky** ◆Elliptical Galaxies: Carbon Monoxide Content vs. Morphology –**Corrie Lambrecht** and **Stephen Bracht**	Room: Beckman 101, "A" on map Chair: **Judy Toronchuk** **B. Social Sciences** ◆Evolution Psychology and Divine Revelation: Synergy, Not Conflict, in Understanding Morality –**Loren Haarsma** ◆Snark or Boojum? Trends in the Integration of Psychology and Christianity –**William Struthers** ◆Radical Centrism and the Redemption of Secular Philosophy –**Ernest Prabhakar**	Room: E. Annex, "C" on map Chair: **Ruth Miller** **C. Engineering, Technology and Ethics from a Christian Perspective** –*Special Session, sponsored by Christian Engineers in Science and Technology* ◆DNAPLs, Kuhn, and the Future of Groundwater Remediation –**Craig Divine** ◆Panel Discussion: Ethics in Engineering and Technology –**Ruth Miller**, Moderator	Room: W. Annex, "C" on map Chair: **Jennifer Wiseman** **D. Our Science and Faith at Work and Church: Engaging the Church** –*Special Session* ◆Science and the Local Church: Confrontation, Avoidance, or Engagement –**Keith Miller** ◆Speaking to Your Church about Science –**Deborah Haarsma** ◆Hermeneutics of the Bible Belt: Struggles in Interpretation –**Max Bonilla** ◆Presenting Cosmology to a Local Church –**Brian Thomas** ◆Roundtable Discussion
10:45 AM	Refreshment Break –Tent			
11:15 AM–12:30 PM Closing Session	Tent Introduction: **Jennifer Wiseman** "Outreach and Service to the Church" –**Hugh Ross** ASA Presidential Address: "ASA in the 21st Century: How to Expand our Vision for Serving the Lord in Science" –**Ken Touryan**			
12:30–1:30 PM	Lunch –Dining Commons, "C" on campus map			
1:45 PM	Check out. **Please return your key to the registration desk.**			

Abstracts

Parallel Session IV-D
Sunday, July 27
1:00–3:15 PM

Resolving Modern Anti-Evolutionary Creationism into Two Distinct Movements

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Resolving Modern Anti-Evolutionary Creationism into Two Distinct Movements

The mainstream media have often characterized intelligent design theory as merely a subset of creation science. Evidence will be presented to challenge this confusion of what actually appear to be two separate creationist schools on the American cultural landscape—schools that need to be distinguished primarily with regard to each movement's origin and developmental stages. The two camps also differ with regard to their styles of argumentation and level of credibility among groups such as professional scientists. In conclusion, the original response of evangelicals to Darwinism will be compared to the arguments of both creation science and intelligent design theorists. In addition, the zones of similarity between the two modern schools—mostly in terms of tactics—will be briefly evaluated. With regard to academic content and rationale, intelligent design and creation science are not properly "lumped" together but rather should be "split"—a fact not presently acknowledged by educational organizations such as the National Center for Science Education. Given the prominence of design theory and creation science in the American church, suggestions are offered to practicing Christians in professional science about how to present the creation-evolution controversy effectively to high school and college-age Christians in ministry settings.

Parallel Session I-A
Saturday, July 26
1:25–3:30 PM

Now That I've Seen Everything, So What?

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Now That I've Seen Everything, So What?

The year 2003 is a year of major advances in cosmology. The data from the MAP (Microwave Anisotropy Probe) has been analyzed and released, revealing new details about the structure of the early universe. Supernovae give further evidence of a new kind of dark energy. On the theoretical front, the Steinhart-Turok cosmological model returns us to an eternal, cyclical universe. What are we to make of these developments as Bible-believing Christians? What are the implications for alternative views of Genesis? Of Revelation? Of the doctrine of Creation?

Parallel Session IV-D
Sunday, July 27
1:00–3:15 PM

The Cambrian Explosion, The Intelligent Design Movement, and the Rising Challenge to Biology Education

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The Cambrian Explosion, the Intelligent Design Movement, and the Rising Challenge to Biology Education

The intelligent design movement is garnering considerable public support in part because of the widespread fear that evolutionary theory opposes theism. Responding to public distaste for evolution, this new anti-evolution initiative is mounting a vigorous campaign nationwide to introduce intelligent design into high school biology as a substitute for evolution, in this way seeking to redirect the whole of American science.

In the view of design theorists, the elimination or even dilution of evolutionary theory in high school biology would benefit all of our society. The discussion of "design" as a proper interpretation of the Cambrian fossils offers a capsule glimpse of what the intelligent design movement seeks for biology education.

Public unhappiness with evolution is fed by the misinterpretation of evolutionary theory which views secular values to be the result of evolution. But substantial scholarship on both sides of the Atlantic shows that, far from being against the Bible, the theory of biological evolution is a logical consequence of the Judeo-Christian-Islamic doctrine of creation. Evolutionary theory springs indeed from biblical precepts.

For their part, ASA members now have a splendid opportunity at hand to assess intelligent design in a historical and theological perspective. The position they entertain might in fact affect both the integrity of American biology education and the public perception of the theological doctrine of creation. Saying "yes" to teaching biological evolution means saying "yes" to the religion of Abraham.

Regulation of the Cell Cycle by the Anaphase-Promoting Complex (APC)

Poster Session
Sunday, July 27
3:30–5:00 PM

Regulation of the Cell Cycle by the Anaphase-Promoting Complex (APC)

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The cell cycle underlies the very essence of life as cells duplicate their genome and cellular components and divide into two daughter cells with high fidelity. The inability to complete cell division accurately leads to deleterious consequences such as cancer. Progression of the mitotic cell cycle is driven by fluctuations of the cyclin-dependent kinase (Cdk) activities. Cdks phosphorylate many proteins within the cell, changing their behavior to promote the entry into mitosis. Conversely, exit from mitosis requires the inactivation of Cdk1 and possibly the dephosphorylation of at least a subset of Cdk1 substrates. Our work focuses on the pathways that lead to the inactivation of Cdk activity at the end of mitosis. Inactivation of Cdk1 is primarily accomplished through ubiquitin-dependent proteolysis of the cyclin subunit, which ensures complete and irreversible inactivation of Cdk activity. Ubiquitin is a small protein that is covalently linked to substrate proteins through isopeptide bonds. Proteins that are poly-ubiquitinated are recognized and degraded by the proteasome. APC is the ubiquitin ligase that targets cyclins for ubiquitination in mitosis. The Cdh1 protein activates the APC and directs its activity toward mitotic cyclins. We have shown that the human Cdk1 phosphorylates the hCdh1 protein preventing its ability to activate APC, and both hCdc14A and hCdc14B dephosphorylate hCdh1 *in vitro*, activating APCCdh1. Cdc14 is regulated in part by subcellular localization; hCdc14A resides at the centrosome, and hCdc14B is in the nucleolus of interphase cells. Our work demonstrates that Cdc14 is a key regulator of mitotic exit by stimulating the inactivation of Cdk1.

Hermeneutics of the Bible Belt: Struggles in Interpretation

Parallel Session V–D
Monday, July 28
9:00–10:45 AM

Hermeneutics of the Bible Belt: Struggles in Interpretation

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The religious dynamics of the Bible Belt have long influenced how the Bible is interpreted and applied in a cultural context that often failed to understand those very dynamics. An exploration of the nature of philosophical background to Bible Belt dynamics will be presented along with some consideration of various implications, in particular the issue of creation/evolution.

Human Population Growth and Control: Religious and Ethical Challenges

Parallel Session II–C
Saturday, July 26
1:25–3:30 PM

Human Population Growth and Control: Religious and Ethical Challenges

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The human population is six billion people and rising. The industrial revolution, better housing, and better health care have reduced infant mortality and increased life expectancy resulting in an exponential growth of the human population. What is the carrying capacity of the Earth for humans? Most estimates run from 7 to 15 billion people—numbers likely to be achieved this century. Some estimates suggest the Earth might sustain appreciably greater numbers of people but with enormous consequences for humans and God's creation. The search for an answer goes to the core of human dignity and justice. What is a minimum quality of life to which humans should be eligible? As the human population has grown, so have numerous problems of environmental degradation, scarcity, and inequality. Historically, the human population has been reduced by war, famine, or pestilence-evils for which Christians may not hope or pray. Alternatively, humans might seek to colonize other planets at what is likely to be extraordinary costs. Or might we seek to responsibly control rates of human procreation? Over the last half century, as global efforts to control human procreation have progressed, people within communities of faith often have resisted, sometimes legitimately, other times detrimentally. God's cultural commission in Genesis 1 is for humans to procreate and be stewards of all creation. Therein lies an enormous challenge for people in communities of faith: How best can we balance the blessings of procreation with the responsibilities of stewardly caring for God's garden?

Parallel Session IV–C
Sunday, July 27
1:00–3:15 PM

Entropy, Information and the Origin of Life

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Entropy, Information and the Origin of Life

Shannon information and Boltzmann entropy are foundational concepts in information theory and in thermodynamics respectively. Their mathematical similarity has given rise to the impression that these are physically or causally connected. The claim that the increase in entropy (second law of thermodynamics) is ultimately responsible for increasing complexity in the biosphere has made its way into both books and journal articles. This presentation will examine the relationship between Shannon information and thermodynamic entropy and consider whether the second law of thermodynamics drives or impedes the increasing complexity of the biosphere. *Cytochrome C* will be used to quantify the informational requirements of a functional protein following the previous work of Yockey. Shannon information will be used to quantify the specified complex information in a function protein (*cytochrome C*) using the suggestion of Brillouin. Various proposed natural processes to account for this specified, complex information will be reviewed. A distinction between living and nonliving systems will be made based on the special capacity of living systems to "levitate" above thermodynamic equilibrium by feeding on "negentropy." This special capacity will be seen to define in part the minimal functional requirements of the simplest living system. This in turn will be related to the informational requirements for the origin of life.

Parallel Session I–C
Saturday, July 26
11:00 AM–12:15 PM

Biological Integrity Assessment of the Conewago and Codorus Watersheds

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A Biological Integrity Assessment of the Conewago and Codorus Watersheds

The Conewago and Codorus Creeks, located in south-central Pennsylvania, were studied to determine their biological integrity. Both creeks have a history of impairment. The Conewago has nine low-head dams, one superfund site, and a few toxic release sites. The Codorus has three superfund sites, one of which is a pulp mill, habitat alterations, and numerous toxic release sites. Physical, chemical, and biological parameters were collected and analyzed by EPA approved methods at six evenly spaced sites in each creek. Chironomids of the genus *Chironomus* were collected at each site to be used for *menta* deformity analysis. In the Conewago, the EPT Index decreased with increases in nitrate-nitrogen levels. Filter feeders increased while the EPT Index and total richness significantly decreased at a site downstream from eight low-head dams. Downstream at the site of a pulp mill, the Codorus Creek had significant impairment as the HBI and Chemical Oxygen Demand (COD) increased while the Erikson Index and dissolved oxygen decreased. Additionally, filter feeders including Hydropsychidae and Corbiculidae increased as COD increased at this site. At most sites in both creeks, increases in *Chironomus menta* deformities mirrored corresponding decreases in the Erikson Index for the sites. In both creeks, the level of impairment decreased as anthropogenic influences decreased. Our data indicated that levels of impairment were more significant in the Codorus than in the Conewago. This data was the catalyst for local watershed associations, facilitating long-term monitoring, developing standards, and improving biological integrity in these two creeks.

Parallel Session I–C
Saturday, July 26
11:00 AM–12:15 PM

Freshwater Mollusks: A Part of Creation in Dire Need of Care

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Freshwater Mollusks: A Part of Creation in Dire Need of Care

Mollusks are important components of many freshwater ecosystems. Many species have very limited ranges due to the relatively isolated nature of freshwater habitats and the limited cross-country dispersal abilities of most mollusks. Freshwater habitats have been extensively affected by humans through dams, pollution, siltation (due to erosion), dredging, and other factors. As a result, many species are critically imperiled, if not extinct. However, freshwater mollusks also show extensive individual variation, reflecting environmental influences. Thus, in many cases it is uncertain whether a distinctive population represents merely a variation of a widespread species or a highly localized and vulnerable species. For example, the European species *Anodonta cygnea*, as currently understood, has received over 200 names. The Coosa River drainage, in southeastern Tennessee, northwestern Georgia, and eastern Alabama, has an exceptionally high diversity of freshwater mollusks, of which two entire genera and numerous species are believed to be already extinct, and many others are officially recognized as endangered. However, many of these species may actually be local morphologies of widespread species. I sequenced three mitochondrial genes from several mussels from the Coosa River drainage and nearby areas in the southeastern U.S. to

look for molecular differences to supplement morphological studies. My analysis of these DNA sequences indicates that some forms are highly endangered species whereas others appear to be local variants of widespread species. These results will be used in improving conservation plans.

Science as a Calling and an Issue: Presenting Science and Faith at Church and at a Campus Fellowship

Parallel Session IV–D
Sunday, July 27
1:00–3:15 PM

Science as a Calling and an Issue: Presenting Science and Faith at Church and at a Campus Fellowship

David C. Campbell
see above

The general interest in science-faith issues frequently leads to questions when people learn that I am a paleobiologist. In light of this interest, I discussed the possibility of giving presentations with my pastor and with the leader of the University of Alabama faculty/staff fellowship. I developed an outline on the topic of science and faith, with illustrations, especially cartoons. Starting with thoughts on a Christian view of science and on science as a Christian calling provides a basic foundation for closer examination of particular topics. The former relies heavily on Genesis 1 for both a rationale for doing science (God's creation should behave predictably) and a command to do science (to rule competently, Gen. 1:26–28). Understanding science as a calling emphasizes Eph. 6:6–8 and parallels. Having established this basis, I then look at the use and misuse of science. Most purportedly scientific attacks on Christianity prove, on examination, to be philosophical claims rather than science. Finally, I examine several areas of perceived conflict between science and faith. For debated issues, I review theological and scientific strengths and weaknesses of multiple approaches.

Galaxy Interactions and the Origin of Quasars

Poster Session
Sunday, July 27
3:30–5:00 PM

Galaxy Interactions and the Origin of Quasars

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Interactions and mergers of galaxies are important mechanisms to feed super massive black holes in the centers of galaxies. In this way, the powerful activity in quasars can be triggered. However, the fraction galaxies hosting quasars that show obvious signs of tidal interactions are relatively small. In this poster, I describe an imaging and spectroscopic project where we use the equivalent of astronomical archaeology to search for remnants of ancient mergers in the seemingly unperturbed quasar host galaxies. Our results indicate that a rather large fraction of these hosts may have indeed undergone violent merger events between 0.5 and 1.5 billion years ago. If these events were responsible for the current quasar activity, then quasars may have longer lifetimes than what was previously thought.

The Pestilence Walking in Darkness: Science and Ethics of Vaccination Policy

Parallel Session IV–C
Sunday, July 27
1:00–3:15 PM

The Pestilence Walking in Darkness: Science and Ethics of Vaccination Policy

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Fears of bioterrorism may alter debate over vaccination policy. For instance, the OHRP and FDA supplemented expert testimony by soliciting public commentary on a proposal to test Dryvax® in preschoolers. Emphasis was placed on screening for factors predisposing to adverse reactions, and on informed consent. In contrast, public health officials have viewed public debate over routine childhood vaccinations as an unfortunate confusion at best and lethal, anti-scientific perversity at the worst. In some states, religious exemption from mandatory childhood vaccination is the only non-medical exception. Even with agreement on principles such as the Belmont Report's "respect, beneficence, and justice," different priorities can lead to divergent conclusions, an observation comporting well with Nicholas Wolterstorff's concept of control beliefs. Proponents of compulsory universal vaccination generally rely heavily on the scientific concept of herd immunity coupled with the ethical maxims "What if everybody did that?" and/or "The greatest good for the greatest number." However, inadequate epidemiological models can lead to oversimplified conclusions. Christian vaccine safety activists have advocated the parents' pivotal role in deciding the best for their child, the body as a temple, and respect for individual differences. Though anti-scientific opposition has done real mischief, medicine's mixed record in areas such as interventions in childbirth, breastfeeding, and general childrearing suggests that careful, scientifically astute critics may be well within their epistemic rights.

Parallel Session II–A
Saturday, July 26
1:25–3:30 PM

Superstring Cosmology: God's Blueprint for the Universe

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Superstring Cosmology: God's Blueprint for the Universe

M-theory, the enhancement of superstring theory, has profound implications for cosmology. It proposes a dramatic new picture of God's universe, vastly more astonishing and beautiful than imagined just a decade ago. I review the most significant aspects of M-theory cosmology, resulting from the combined effects of (1) M-theory's (10+1)-dimensional spacetime as compared to string theory's (9+1)-dimensional spacetime, (2) M-theory's realization of widths to strings, determined by the size of the additional spatial direction (transforming strings into membranes), and (3) the M-theory prediction of special spatial surfaces called D-branes. I discuss the Randall-Sundrum model and its extensions, which offer a D-brane explanation for the weakness of gravity in our 3+1 large dimensions. A fundamental question is, "What is the M-theory energy scale and corresponding length scale?" I review the recent astronomical measurements of John Webb et al. suggesting the M-theory energy scale to be much lower than the traditional 10^{18} Gev string scale. Some of the "physical constants" in nature, such as the fine-structure constant, specifying the strength of electromagnetic interactions, may have been varying significantly only a few billion years ago. This suggests a low energy M-theory scale and a related long time before some compactified directions stabilized, which implies that gravity may stop acting as a 1/r^2 force at distances somewhere below a millimeter. The distance at which deviation from 1/r^2 begins corresponds to the size of the eleventh dimension. Recent University of Washington experiments verify gravity as a 1/r^2 force down to 0.2 mm.

Parallel Session IV–C
Sunday, July 27
1:00–3:15 PM

PCR Detection of *Plasmodium falciparum* Strains and Their Relationship to the Severity of Malaria

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PCR Detection of *Plasmodium falciparum* Strains and Their Relationship to the Severity of Malaria

Each year, approximately 300–500 million new cases of malaria are diagnosed; two-thirds of these concentrated in Africa. *Plasmodium falciparum*, the most virulent of the four malarial species, clinically manifests itself as either complicated or uncomplicated malaria. This study attempts to determine the possible relationship between distinct *P. falciparum* strains and the severity of the disease. Blood samples from Zambia were analyzed using polymerase chain reaction (PCR) to isolate and multiply the gene encoding for merozoite surface protein-1 (msp1). Further nested PCR analysis was done on the msp1 product to separate the *P. falciparum* strains into msp1families (K1, MAD20, R033). Eight strains were identified by base pair size using agarose gel electrophoresis. Upon careful analysis of the results, no apparent pattern can be determined or correlation made between strain(s) of *P. falciparum* and diagnosis of the disease.

Parallel Session IV–D
Sunday, July 27
1:00–3:15 PM

Teaching Honors Level Philosophy of Science/Origins Science in a Christian University Environment

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Teaching Honors Level Philosophy of Science/Origins Science in a Christian University Environment

The need for a upper-division science/philosophy class to address origins and scientific philosohical issues, and an honors level seminar for freshman, led to an honors level Philosophy of Science class in the spring of 2002 and 2003. A unique guest lecture/reading based format was developed where the students heard weekly guest lectures from seven different academic departments and had weekly discussion groups alternating between a science and a philosophy instructor/moderator. The reading was essential to the class and used *Philosophy of Science*, Hempel; *Reason in the Balance,* Johnson*; Science and Religion,* McGrath*; Show Me God,* Hereen*; Darwin's Black Box,* Behe*; The Blind Watchmaker,* Dawkins*; How to Think About Evolution,* Thurman*; Bioethics,* Veatch; and others. A survey was taken of the students' reactions and opinions of the class to determine viewpoints and knowledge prior to, and at the completion, of the class. The results were very encouraging, and suggest ways of handling controversial origin issues in a Christian university setting. We attempted to strike a balance between traditional Philosophy of Science courses and apologetic oriented classes. With some small modification, the course format could be adapted to a more secular setting.

Copernicus and the Tale of the Pale Blue Dot

Most of us have at some point heard the claim that Copernicus, by "dethroning" earth from the center of the universe, "showed" that Earth and Earth's inhabitants are cosmically not very special.

This claim is routinely extrapolated to function as a principle—the "Copernican Principle"—according to which not only is Earth merely one planet among many, but also the Milky Way is merely one galaxy among many, and perhaps what we think of as the whole cosmos is merely one universe among many. Moreover, this "principle" is enlisted to show that science trumps religion: while religion wants to enthrone Earth-dwelling human beings in the center of the universe, science authoritatively demonstrates (in more ways than one) the "mediocrity" of our place. From Fontenelle in the seventeenth century to Carl Sagan in the late twentieth, Copernicus is thus used to bring down human pride, which supposedly stems from our naive religious illusions.

Unfortunately, this comic-book version of the meaning of Copernicus is all but universally accepted by many educated people, including some scientists, whose capacity to weigh evidence ought to make them capable of a more well-informed, critical view. An effort to attain such a critical view—based on the exciting words Copernicus and his followers, and on a measure of undogmatic careful thinking—can revitalize our perception not only of Copernicus in his own age but also of the interplay between science and metascientific assumptions today.

Plenary Session
Saturday, July 26
7:30–8:45 PM

Copernicus and the Tale of the Pale Blue Dot

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Biogeographic and Trophic Restructuring of the Biosphere: The Earth under Human Domination

Climate change is causing shifts in ranges of plants and animals that average 3.8 miles per decade, nearly one-third of arable lands have taken out of production due to erosion, and biodiversity is being seriously reduced through habitat destruction, deforestation, global toxification, introduction of exotic species, and changing climate. Overexploitation of the oceans has brought collapse of the world's major fisheries and adversely restructured ocean food webs; the biosphere has come under human domination. We have become, like it or not, stewards of the biosphere. This requires a refreshed and robust stewardship that (1) incorporates preservation of biospheric systems that are working quite well, (2) applies the physician's art of setting the conditions for restoration and healing of what has been degraded, and (3) makes peace with creation in deliberate and determined reconciliation. In achieving responsible stewardship, we need to identify responsible paradigms (examples) already in place, replicate these, and invent new and effective stewardship responses at all levels of biospheric operations. We must continue our progression from reservation ecology and restoration ecology on to reconciliation ecology. We must make significant contributions to biospheric stewardship by publishing not only in journals and web pages, but also in lives and landscapes, bringing good news to every creature.

Parallel Session II-C
Saturday, July 26
1:25–3:30 PM

Biogeographic and Trophic Restructuring of the Biosphere: The Earth under Human Domination

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DNAPLs, Kuhn, and the Future of Groundwater Remediation

Dense nonaqueous phase liquids (DNAPLs), which include chlorinated solvents, coal tars, and heavy petroleum distillates, represent one of the most widespread and problematic classes of groundwater contaminants. It is estimated that $3.7–4.9 billion/year is spent addressing DNAPL and related sites in the US alone, and average remediation costs are ~$5 million per site (USEPA, 1997 and Rao, 2002). Typically, DNAPLs have drinking water standards that are ~10–5 times lower than their aqueous solubilities, and they can form complex and unpredictable architectures in the subsurface. Consequently, even relatively small DNAPL volumes are extremely difficult to characterize and remediate, and can produce groundwater plumes that are both large (several km-long) and persistent (decades to centuries). Prior to the early 1990s the significance of subsurface DNAPL was poorly understood or ignored, resulting in the failure of many early remediation efforts. Currently, the accepted "paradigm" suggests that meaningful and cost-effective remediation of DNAPL zones is impractical or impossible. Therefore, the general default strategy consists primarily of long-term dissolved plume management and receptor/exposure point control. However, recent technological advances have significantly increased interest in DNAPL zone treatment, and some groups now advocate for partial DNAPL removal. While the specific impact of partial DNAPL removal is still poorly understood, its technical possibility is forcing new discussion regarding cost-effectiveness determination and the implicit value of remediation. Several new promising technologies will be presented and possible methods for evaluating benefits of partial DNAPL removal will be discussed.

Parallel Session V-C
Monday, July 28
9:00–10:45 AM

DNAPLs, Kuhn, and the Future of Groundwater Remediation

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Poster Session
Sunday, July 27
3:30–5:00 PM

A Lightless Precursor to the Observable Universe: Genesis 1:3

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A Lightless Precursor to the Observable Universe: Genesis 1:3

A recent cosmology has the observable universe's entire energy arising from a vacuum (existing without a beginning). A concept of the writer William Foulks, and his brother Edwin, proposes that all the matter in the observable universe once existed, from infinite past, always moving at the velocity of light (wherein, by Relativity Theory, its time never started), relative to a surrounding, very-distant space-time, extending to infinite past time (in which exist some remote, different-velocity particles, very-low energy neutrinos) and where that matter which is moving at the velocity of light is composed of an absolutely quiescent arrangement of non-contacting neutrons, anti-neutrons, protons, and anti-protons. Within this matter moving at the velocity of light, Relativity says time has not begun. None of the protons, neutrons, anti-protons, and anti-neutrons move relative to each other: zero time, nothing changes. When the first particle/wave from the remote, but-surrounding, infinite space-time impacts that mass which is moving at the velocity of light, velocity decreases. Time begins therein. Particles, anti-particles annihilate: vast radiation release ("Let there be light," Gen. 1:3). Big Bang. Some matter survives (perhaps, anti-matter). Anisotropic precursor locales, within the mass, facilitate galaxies' formation. Deuterium, etc., form. Initially this mass could have solar-system dimensions. Now: our observable universe.

Parallel Session IV–C
Sunday, July 27
1:00–3:15 PM

The Effects of Bt Corn Pollen on Green Lacewing (*Chrysoperla carnea*) Longevity, Survivability, and Fecundity

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The Effects of Bt Corn Pollen on Green Lacewing (*Chrysoperla carnea*) Longevity, Survivability, and Fecundity

In an attempt to control the destruction of the European Corn Borer (Lepidoptera: *Ostrina nubilalis*) on corn, the gene controlling the production of the endotoxin of the bacterium *Bacillus thuringiensis* has been genetically inserted into some strains of corn (*Zea mays*). Due to the expression of the Bt endotoxin throughout the tissues of the corn plants, concern has been raised over the effect of Bt corn on non-target species. Several studies have been completed, with varying results, on the effects of the Bt corn on both the Black Swallowtail and the Monarch Butterfly. The impact on non-Lepidoptera species remains in question. This study reports the effects of Bt corn pollen on adult *Chrysoperla carnea*. This species is significant because of its predatory larval stage that serves as an important biological control agent within corn fields. Adult *Chrysoperla carnea* feed on a mixture of nectar, pollen, and honeydew. The purpose of this study was to observe the effects of Bt corn pollen on the longevity, fecundity, and survivability of adult *Chrysoperla carne*a group individuals. The *Chrysoperla carnea* were fed Mycogen 2249 IMI 176 Bt, Mycogen 2250 IMI, Pioneer 38G17, and Pioneer 3893 pollen. Tentative results show no negative effects on adult survivability or egg development. No negative effect of the Mycogen Bt strain on fecundity was determined. However, results show that the Pioneer Bt pollen negatively effected egg production. A confirmational study will be completed in the fall of 2003.

Parallel Session IV–B
Sunday, July 27
1:00–3:15 PM

The Martian Fossil Controversy: Theological Implications from an Earthly Parallel

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The Martian Fossil Controversy: Theological Implications from an Earthly Parallel

In 1996, with overwhelming media fanfare, a seminal paper revealed "possible relic biogenic activity on Mars." The rock in question was a Martian meteorite, and debate continues as to the authenticity of the paper's conclusions. In 1865, but with less media attention, another seminal paper revealed the discovery of possible relic life forms in the Precambrian or "pre-life" rocks of Canada. The principle investigator was Sir William Dawson, eminent geologist, principal of McGill University (1855–1893) and an evangelical Presbyterian. The debate that ensued has many parallels to the current Martian controversy, including questions concerning mineralogy (in some cases the same minerals) and the capricious nature of "state of the art" microscopy. Dawson also promoted a theology for accommodating these discoveries into his own strong faith. Eventually, despite his many books and articles supporting the biological origins for these particular fossils, and the many scientific honors bestowed on Dawson, the fossils in question were eventually proven to be inorganic. Ironically, the culprit was the mineral serpentine (named after the serpent). Dawson's work, however, led to the acceptance of many other ancient life forms and a relevant theology. This included Dawson's stance that revelation concerning origins, like creation itself, is progressive. Will the Martian fossils take a parallel route? Evidence thus far indicates that the answer could be yes.

Kepler: Astronomy from the Eyes of Faith

Kepler's life and works provide central evidence that an individual can be both a creative scientist and a believer in divine design in the universe, and that indeed the very motivation for the scientific research can stem from a desire to trace God's handiwork. Trained as a theologian, Kepler became one of the most creative astronomers of all time, a man who played a major role in bringing about the acceptance of the Copernican system through the efficacy of his tables of planetary motion. One of the principal reasons he became a Copernican arose from his deeply held belief that the sun-centered arrangement reflected a Trinitarian design of the cosmos. In the introduction to his *Astronomia Nova*, truly the New Astronomy, he defended his Copernicanism from the point of view that the heavens declare the glory of God.

Parallel Session IV–B
Sunday, July 27
1:00–3:15 PM

Kepler: Astronomy from the Eyes of Faith

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Give Me Some of That Old-Time Theology: A Reflection on Charles Hodge's Discussion of Concursus in Light of Recent Discussions of Divine Action in Nature

Howard Van Till has suggested that traditional theological categories are unable to bear our current understanding of the character of the universe resulting from modern scientific investigation. He claims that notions such as "functional integrity" and the "Robust Formational Economy Principle (RFEP)" are not compatible with traditional discussions of creation and providence. He uses in a derogatory manner words and phrases such as "coercion," "supernatural intervention," "apparent creaturely action," and "divine Puppeteer." For a solution he appeals to process theology and its panentheistic view of the relationship between God and the world together with the language of "persuasion" and "authentic creaturely action." (I also suspect that the problem of evil raised by traditional Calvinistic views of "divine providence" also contribute to Van Till's exploration of process theology.) While I am sympathetic with Van Till's notions of "functional integrity" and "RFEP," I disagree that we need to rework our traditional understanding of the relationship between God and creation. Perhaps we simply need to review it. The discussion of concursus in the context of divine governance in Charles Hodge's *Systematic Theology* addresses many of these same issues. The traditional Calvinistic formulation is fully able to bear our current understanding without the problems that accompany an appeal to process theology.

Parallel Session II–B
Saturday, July 26
1:25–3:30 PM

Give Me Some of That Old-Time Theology: A Reflection on Charles Hodge's Discussion of Concursus in Light of Recent Discussions of Divine Action in Nature

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A Universe of Wonder

Come along for a journey through recent discoverers in astronomy and cosmology. Starting from our own solar system, we will explore the neighborhood of the Sun in a spiral arm of the Milky Way, then look out to other galaxies, finally catching sight of the farthest reaches of the observable universe. At each stop, we will recognize the face of the Creator in the beauty, power, intricacy, and glory of his creation, and discover anew the Christian basis for our work as scientists.

Plenary Session
Friday, July 25
7:30–9:00 PM

A Universe of Wonder

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Speaking to Your Church about Science

As a scientist and Christian, you may be asked to speak about issues of science and faith to Christians who are not scientists. The audience usually walks in the door worried about the "war between creation and evolution," but I have found that this issue is not the best place to start. I will share my advice on where to start (God's general and special revelation), what to say in the middle (defining your terms, etc.), and where to end (ideas on which all Christians agree).

Parallel Session V–D
Monday, July 28
9:00–10:45 AM

Speaking to Your Church about Science

Deborah B. Haarsma
see above

Evolutionary Psychology and Divine Revelation: Synergy, Not Conflict, in Understanding Morality

Sociobiology and evolutionary psychology study human behavioral dispositions in an evolutionary framework. Much recent scientific work has focused on the evolution of altruism, morality, and religious dispositions. In this talk, I will survey the latest hypotheses on the evolution of altruism and morality. Unfortunately, in popular literature, these scientific fields are sometimes used to support the philosophical claims that human moral and religious beliefs have no objective status or

Parallel Session V–B
Monday, July 28
9:00–10:45 AM

Evolutionary Psychology and Divine Revelation: Synergy, Not Conflict, in Understanding Morality

Loren D. Haarsma

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truth content. I will analyze some of these philosophical arguments and show that they are unnecessary additions to the science. When pursued with proper care and humility, the scientific results of sociobiology and evolutionary psychology have the potential to tell us some true and useful things about the history and present functioning of our moral sentiments, and the results can be compatible with essential Christian beliefs. Evolutionary accounts, while potentially compatible with Christian beliefs, are incapable of achieving the full picture of human morality which Christian theology requires. Christian theology teaches not only that moral and religious sentiments are intrinsic parts of our human nature, but also that God has personally revealed himself to human beings. Divine personal revelation in history provides exactly what evolutionary accounts lack to achieve this full picture. Divine revelation enriches the horizontal, inter-personal axis of morality and adds a vertical, divine-human axis to morality.

Parallel Session IV–D
Sunday, July 27
1:00–3:15 PM

Talking about God with Scientists

Loren D. Haarsma
see above

Talking about God with Scientists

I will discuss some common barriers to the gospel amongst scientists, and my experiences in conversations and lectures in addressing those barriers. When confronting these barriers, we can show many points of agreement between a typical scientist's world view and a Christian world view, while carefully and strategically delineating points of difference. For example: Science is not intrinsically atheistic; Christianity provides motivation to do science and a philosophical framework for expecting scientific methods to work. Scientific knowledge is not the only kind of knowledge; every day we use and trust knowledge from personal experiences and trustworthy testimony. Faith and reason are not opposites; the popular definition of "faith" (believing in something despite lack of evidence) is a poor caricature of what Christians mean by "faith." While different religions often agree on moral issues, each religion has a unique answer regarding the fundamental nature of the Divine and how we are reconciled to the Divine. Questions of God's apparent lack of involvement in the world and the problem of evil often arise, and this opens the door to presenting Christianity's unique (and shocking) answer to those questions: the incarnation, death and resurrection of God in Jesus Christ. The listener is encouraged to understand the importance of pursing the question of God's existence and nature, and that the best method of inquiry for these questions is not scientific, but by seeking personal and social experience of God in prayer and Scripture.

Poster Session
Sunday, July 27
3:30–5:00 PM

Implications of Cell Death in the Generation of Autoimmune Response

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Implications of Cell Death in the Generation of Autoimmune Responses

When the immune system reacts against self tissues rather than foreign antigens, autoimmune diseases, such as lupus and rheumatoid arthritis, can develop. This breakdown of self tolerance could occur if self antigens are presented as novel structures or within novel contexts. For example, the antigen may be covalently modified, proteolytically cleaved, or may be presented in an inflammatory environment.

While apoptotic cell death leads to tolerance generation, other types of cell death may be immune stimulatory.[1] Work by this laboratory has shown that 80% of autoantigens targeted in systemic autoimmune diseases are cleaved by granzyme B (grB), a protease contained within the cytotoxic granules released by T cells and natural killer cells.[2] We therefore hypothesize that when cells die by granule content mediated cell death, novel epitopes are revealed, which if unveiled in an inflammatory environment, could allow for the initiation and propagation of autoimmune responses.

Since heat shock proteins aid in protein folding, are upregulated during cell stress, are released from dying cells, play a role in antigen processing and presentation,[3] and are powerful endogenous adjuvants,[4] we have begun to investigate the role that heat shock proteins, might play in the breakage of tolerance to autoantigens. We are currently testing the hypothesis that heat shock proteins might preferentially bind with chaperone autoantigens which are granzyme B (grB) substrates. Such preferential binding could explain why a majority of proteins targeted in autoimmune responses have granzyme B cleavage sites.

Reference List

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Walking and Talking: Physical, Social, and Spiritual Benefits

Parallel Session IV–C
Sunday, July 27
1:00–3:15 PM

Walking and Talking: Physical, Social, and Spiritual Benefits

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Walking and talking were the two functions that assured the early survival, growth, and proliferation of the human species. Evidence exists which places bipedalism as early as five to six million years ago and early human communication may have mimicked animal sounds that related to survival strategies. We are constantly reminded of the physical benefits of exercise through walking. We are relationship oriented and walking and talking provides a social bonding particularly in groups of two or more where conversation ensues. The Bible contains many references to those who walked and talked with God as a metaphor for those who followed God's will and guidance. This presentation looks at walking and talking from the viewpoint of physical, social, and spiritual benefits with the addition of some selected, direct experimental data taken and analyzed by the authors on the noonday walking and talking habits of groups of people in an industrial setting in Arizona. Observations on weekdays covering a 12-year period showed interesting features: how walkers tended to group themselves, whether they were talking as they walked, and how weather conditions were related to the number of walkers. The weather-related data has been shared with students to draw conclusions on optimum seasonal and daily walking conditions.

Christian Environmentalists: A Political Force To Be Reckoned With

Parallel Session I–C
Saturday, July 26
11:00 AM–12:15 PM

Christian Environmentalists: A Political Force To Be Reckoned With

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The last half-century has demonstrated an exponential growth of people vehemently concerned about destructive environmental lifestyles. In the last decade, environmentalists have become a voting majority in many first-world countries. Although not a currently well-organized political force to be seriously reckoned with, in the next few years this rapidly growing number of environmentalists will prove to be, by far, the largest voting population shaping our world. Sadly, the majority of self-proclaimed "Christians" and preachers mock, and even condemn the environmental movement and the responsibilities it demands. Consequently, and alarmingly so, Christians are being labeled as pompous, ignorant, self-righteous, insolent fools who are viewed as enemies of those who have a heart and mind to do what is right in God's eyes (Rom. 2:14–15). A new generation of Christians, a growing number of educated scientists and engineers, are struggling with this shameful labeling situation, and are seeking ways to rightfully reclaim and proclaim the proper perspective of who Jesus Christ really is, and what his stand is concerning environmentalism. This paper presents scripturally-based perspectives concerning environmentalism, and most importantly, information giving us a better understanding of that which is more likely to be "well pleasing in his sight," the "good things" that will be accepted in his kingdom (Heb. 13:20). Scripturally-based keys for preferred technologies evaluations, with criteria for designs, will be presented.

Observing the Evolution of Stars like the Sun

Parallel Session V–A
Monday, July 28
9:00–10:45 AM

Observing the Evolution of Stars like the Sun

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Stars do not remain the same forever. Instead they evolve as the nuclear reactions occurring in their interiors convert hydrogen to successively heavier elements. This results in readjustments of their interior structures. Stars with masses like the sun eventually evolve to become red giants, lose their outer layers of gas which are seen to be expanding away from the star as a so-called planetary nebula, and finally the remaining star cools as a white dwarf. The glowing gas shells of planetary nebulae make them some of the most beautiful objects observed in the cosmos. The fine detail

observed with the Hubble Space Telescope reveals complex but orderly patterns with spherical, axial, and point symmetry. But this also poses a problem; how did the gas lost in an apparently spherically-symmetric manner by the red giant develop such complex shapes? I have been investigating this problem by studying the proto-planetary nebulae, objects in the transitional stage in which the star has just lost its outer gaseous layer but is not yet hot enough to ionize the gas and cause it to emit light. Our recent Hubble images show the development of the complex structure and suggest a shaping mechanism(s). We have also gone on to study the chemistry of both the star and the ejected gas. These give us information regarding the nucleosynthesis inside the star and the active chemistry going on in the expanding gas shell, respectively. The support of the NSF and NASA for this research is gratefully acknowledged.

Poster Session
Sunday, July 27
3:30–5:00 PM

Applying God's Message in Nature

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Applying God's Message in Nature

In this paper, I will discuss and defend the thesis that God's revelation in nature, as illuminated by science, can be used to help Christians decide among equally permissible interpretations of Scripture. God reveals himself to humans through Scripture (special revelation) and through what humans observe in the natural world (general revelation). For evangelical Christians, the Bible is the ultimate authority for all matters pertaining to the Christian life. Scripture is considered to be infallible and inerrant because it was authored by the Holy Spirit (through human agents) and has been preserved by him through the ages. However, humans must interpret the Bible to understand its full meaning and this process is not infallible because of sin. Evangelicals generally depend on Scripture to illuminate its own meaning. Conservative theologians frown upon the use of extra-biblical resources (i.e. man's interpretation of general revelation) because this tends to give the extra-biblical resource authority over Scripture. However, in cases where Scripture does not provide a decisive answer, I suggest that evidence from general revelation obtained through science can be used to inform Scripture interpretation with the understanding that such conclusions are necessarily tentative, as are all scientific statements. I will give two historical examples where this principle has already been applied (procreation, the rising and setting of the Sun) and I will discuss the application of this principle to a contemporary question and the timing of the creation events described in Genesis 1–2.

Parallel Session IV–D
Sunday, July 27
1:00–3:15 PM

Relativism and Engineering Education

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Relativism and Engineering Education

As Christians we believe our world view helps us understand the physical world God has created. This paper grew out of a concern that some engineering faculty are using certain teaching techniques in an attempt to impose non-Christian world views on their students. This problem first surfaced with engineering design courses. In a 1990 paper in *Engineering Education*, Culver, Woods, and Finch proposed monitoring the effectiveness of design instruction by the degree to which the students embrace a relativistic world view at the end of the course. Most engineering students are philosophically naive, and may easily be convinced of this perspective. Another aspect of this problem is shown by the changes many faculty have made in teaching freshman and sophomore engineering courses. Many engineering faculty have moved away from the traditional lecture method. They now use more active learning techniques, where small groups of students learn much of the course content through group activities. There is evidence that this approach helps the students learn more effectively. Both authors use active learning techniques in many of their classes. However, at the heart of this approach, there is a problem. It is based on a constructivist view of the world, where students construct their own reality as they solve problems as a team. If not guided correctly, students may come to completely erroneous conclusions about our physical world. They may be also convinced that their conclusions about reality are as good as that of the professor or textbook author. We recommend ways in which the good aspects of active learning can be utilized without buying into the dangerous world view that many of its proponents proclaim.

Poster Session
Sunday, July 27
3:30–5:00 PM

Selection and Analysis of Escape Variant Mutations Affecting Epitope IV of the Simian Virus 40 Large Tumor Antigen

The Simian Virus 40 Large Tumor Antigen (SV40 T ag) contains four distinct epitopes, I, II/III, IV, and V, that are individually recognized by one or more H-2b-restricted cytotoxic T lymphocyte

(CTL) clones. The SV40 T ag induces cellular immortalization and tumor formation, but epitopes within the T antigen induce CD8+ T lymphocyte responses that can effectively control the growth of T antigen-expressing tumors *in vivo*. In fact, epitope IV-specific CD8+ T cells have been shown to control endogenous, SV40 Tag-induced tumors in a transgenic mouse model. We are interested in how naturally occurring mutations that affect epitope IV will allow for the survival of T antigen-expressing tumors in the presence of epitope IV-specific CD8+ T cells. Because epitope IV is located within a region of the T ag that is essential for cellular transformation, only substitutions or small in frame deletions are expected to allow for escape while maintaining cellular proliferation. Escape variant populations have been selected by repeated exposure of murine B6/K-0 T ag transformed cells the epitope IV specific CTL clone, SV2168 B cl6. Variant epitope sequences were amplified by PCR, individual amplification products were subcloned to generate recombinant libraries, and the nucleotide sequences of the epitope regions harbored by multiple, randomly chosen recombinant plasmids were analyzed. The results of this study will be discussed in light of previous epitope IV selections that utilized the epitope IV-specific CTL clone Y-4.

Selection and Analysis of Escape Variant Mutations Affecting Epitope IV of the Simian Virus 40 Large Tumor Antigen

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Objections to Planetary Conjunction Hypotheses for the Identity of the Star of the Maji

Planetary conjunctions, particularly those of Jupiter and Saturn in Pisces (6/7 BC) and more recently Jupiter and Venus in Leo (2 BC), in combination with some astrological system of interpretation, are the most popular explanations given by astronomers and others for the Star of the Magi. After briefly tracing the history of such hypotheses, difficulties with each are examined.

The involvement of astrology, at least in its traditional forms (as in Ptolemy's *Tetrabiblos*), is argued to be problematic both theologically and scientifically, yet planetary conjunction hypotheses require it. This problem, as well as numerous other objections based on such things as their frequency, sky position, visibility in Jerusalem, as well as on the likely identity of the Magi, the singularity of Matthew's word for "star," and their being a different explanation that fits Matthew's account and its biblical context much better than does any planetary conjunction, argue against these commonly accepted proposals for identifying the Christmas star.

It is suggested that the popularity of such explanations derives partly either from a rejection of, or an embarrassment with, the blatant supernaturalism of the biblical account or from a willingness to grab onto any explanation that has an air of science and that seems to confirm the accuracy of the biblical text.

Parallel Session I–B
Saturday, July 26
11:00 AM–12:15 PM

Objections to Planetary Conjunction Hypotheses for the Identity of the Star of the Maji

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Privileged Planet Theses

This Special Session will examine the idea of Earth as a very unusual place, uniquely designed for life as we know it by an intelligent being. G. Gonzalez and J. Richards will present theses detailing these views (see below). K. Kuehn will present some critical objections to the theory. Plenary speaker D. Danielson will reflect on a similar controversy in the time of Copernicus. M. Keas will discuss how to present these ideas in the classroom setting. A closing panel discussion will provide a lively forum for exchanging views.

Habitability Thesis: Life, simple and especially complex, is very uncommon in the universe. This thesis, although not new, has become more detailed and scientifically rigorous in its latest instantiation within the new discipline of astrobiology.

Habitability-Measurability[1] Correlation Thesis: The conditions that allow for intelligent life on Earth also make it strangely well suited for measuring the universe (viewing and analyzing the cosmos in scientifically-fruitful ways). This thesis is new and it strongly suggests a purposeful intelligent agency as the cause of this strange correlation.

Note:
[1]Measurability: those features of the universe as a whole, and especially to our particular location in both space and time which allow us to detect, observe, discover, and determine such features as the size, age, history, laws, and other properties of the physical universe.

Parallel Session IV–A
Sunday, July 27
1:00–3:15 PM

Is Earth a Privileged Planet?

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Plenary Session
Saturday, July 26
9:00–10:15 AM

Watching Galaxies Form Near the Beginning of Time

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Watching Galaxies Form Near the Beginning of Time

Because of the immense size of the universe and the finite speed of light, astronomical telescopes are one-way time machines, giving us views of the distant past as we look farther out into the universe. Distant galaxies are seen in their youth, when the universe itself was only 10–20% of its present age. The ways in which galaxies have changed over time provides us with one of the most direct signs that the universe we live in has a history: the early universe was a quite different place from what we see in our immediate vicinity today.

New technological developments are allowing us to see early phases in galaxy history with increasing clarity. These include observations from such space borne platforms as Hubble and Chandra, application of adaptive optics to improve the image quality delivered by large ground-based telescopes, vast improvements in detectors at submillimeter wavelengths, and the ability to winnow subtle signatures of history from the fossil record of ancient stars in our own galaxy.

Looking back most of the way to the epoch of creation, we find a surprising variety of phenomena among galaxies. Some galaxies are very luminous and comprise only stars that are already ancient even at these early times; others are small but brilliant, forming stars briskly and perhaps assembling into larger systems by repeated mergers; still others emit most of their energy through the far-infrared radiation from heated dust. The development of quasars, powered by massive black holes, seems tied to the development of dense central bulges in early galaxies. And the development of galaxies themselves appears to be controlled by the still mysterious dark matter that constitutes most of the material in the Universe. We will look at what these and other phenomena tell us about conditions in the early Universe. We will also show how massive galaxies allow the recycling of heavy elements produced in stars, setting the stage for later generations of stars to have planets and providing the materials on which all life depends. “The heavens declare the glory of God.” The Psalmist could find this glory in the few thousand stars he could see on a dark night. The Universe we can observe today has a few hundred billion galaxies, each averaging about one hundred billion stars, ranging over immense distances and deep expanses of time.

The picture of the history of the Universe that is emerging, though still very incomplete, is far richer, more complex, and, yes, more glorious, than we could have imagined even a few years ago.

Poster Session
Sunday, July 27
3:30–5:00 PM

The Glorious Liberty of the Children of God

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The Glorious Liberty of the Children of God

Modern materialistic science is based on the scientific method plus a postulate. Their postulate is that spirits (non-material beings) cannot be dealt with by science. Those of us who believe the Bible do not have to accept that.

Instead, we are starting with the scientific method plus the postulate that life is a spirit and can be observed and studied when the spirit is associated with matter, i.e., when we have a living system such as a live human being or a living cell. We know and believe this assumption is true although we cannot “prove” it. We can work with it and go where it leads us. That is what a postulate is.

Next, we go on to another postulate: Holy human life or Eternal Life is a Spirit and is real and can be observed and studied when that Spirit is associated with matter, as in a living human being.

This gives us, as scientists, an integrity which we did not have when our hearts were committed to God on the one hand, and our minds were committed to Godless science on the other hand. This paper gives rationale for, and applications of, the theory.

Parallel Session II–C
Saturday, July 26
1:25–3:30 PM

Biotechnology as Restoration: Can We Feed Ten Billion People and Protect Ecosystem Integrity?

Biotechnologists envision a bright future where disease, hunger, pollution, and other maladies will be wiped out through clever applications of recombinant DNA. Biotechnology, they argue, is

essential to adequately feed the ten billion people expected by 2050. Why then the public outcry against it? Biotechnology proponents often impulsively disregard fears about "super weeds" or "Frankenfoods." In doing so, they fail to recognize the public's "more textured [concerns] with issues such as globalization and stratification of power, ethics, equity, and individual rights and choice" (Sagar, et al., *Nature Biotechnology* 18 [2000]: 2–4). Decades of environmental abuses, fed by the naïveté of reductionistic science, have instilled in many citizens a healthy skepticism for claims that sound too good to be true. Some call for a total rejection of biotechnology as a sustainable solution to food security issues. Are they right? I contend that agbiotech should have a role in improving food security. However, to do so we must adopt a paradigm that is more environmentally and socially responsible. A theistic framework, which understands our vocation as restoring God's creation, can inform a paradigm that integrates biotechnology with agroecology. Joining biotechnology with breeding and ecological means to restore and enhance biological interactions could give rise to more resilient agricultural systems, such as polyculture. This type of research would necessitate collaborations with stakeholders to develop contextually appropriate solutions and to better conform our endeavors to the values and concerns of local communities and cultures. It would protect the integrity and diversity of God's creation.

Biotechnology as Restoration: Can We Feed Ten Billion People and Protect Ecosystem Integrity?

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Elliptical Galaxies: Carbon Monoxide Content vs. Morphology

Studies of elliptical galaxies have led to the detection of molecular gas (carbon monoxide [CO] emission) in some, but not all of these galaxies. Observations of these galaxies have also found that they tend to be boxy, disky, or a combination of both in shape. Detailed studies of the kinematics of disky ellipticals suggest that cold gas must have been important in the formation of these types of systems. In contrast, boxy galaxies are thought to have been formed in gas-poor, equal-mass mergers of spiral galaxies. These hypotheses make a testable prediction: if cold gas is necessary for the formation of disky systems but not for boxy systems, one might expect the CO detection rate to be higher among the disky ellipticals than the boxy ones. We intend to take data on about fifty early-type galaxies, 40% of which have had detections of CO in them. From this data we will be able to compare the distribution of CO among boxy and disky galaxies, giving us clues to the formation and evolution of early-type galaxies. This analysis has not been done before because there is not enough existing data. Even though dozens of galaxies have been determined to be either boxy or disky, and even more have been searched for CO emission, these samples do not overlap very much. Essentially, we will be looking at elliptical galaxies where the status of CO has been determined and identifying the shape classification of the galaxy.

Parallel Session V-A
Monday, July 28
9:00–10:45 AM

Elliptical Galaxies: Carbon Monoxide Content vs. Morphology

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Galileo the Theologian: Hermeneutical Insights for Today

The early seventeenth-century astronomer Galileo Galilei is well known for his contribution to science. Regrettably, his confrontation with church authorities and his trial have come to symbolize a popular understanding of the relationship between science and religion—the conflict or warfare model. However, a re-examination of the historical record now recognizes that the so-called "Galileo Affair" is much more complex than a simple battle between scientific advance and Christian faith. This paper argues that Galileo was not only a great scientist, but his approach to the Bible offers valuable hermeneutical insights for Christians today. A review of his "Letter to Castelli" (1613) and "Letter to Grand Duchess Christiana" (1615) reveals principles of scriptural interpretation regarding: (1) biblical inerrancy and infallibility, (2) authorial intentionality, (3) the incidental character of scientific statements in Scripture, and (4) the notion of accommodation. Though Galileo provides a sophisticated hermeneutic for his time, he still was a man of the seventeenth century influenced by the powerful lure of concordism, and this feature will be presented and discussed. Galileo's hermeneutic can be summarized in the aphorism he popularized: "The intention of the Holy Spirit is to teach us how one goes to heaven and not how heaven goes." With this approach to biblical interpretation, our generation can recast these words in the light of evolutionary theory: "The intention of the Bible is to teach us that God is the Creator, and not how the Father, Son and Holy Spirit created."

Parallel Session IV–B
Sunday, July 27
1:00–3:15 PM

Galileo the Theologian: Hermeneutical Insights for Today

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Poster Session
Sunday, July 27
3:30–5:00 PM

From Giant Nebulae to Globular Clusters

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From Giant Nebulae to Globular Cluster

Two of the most magnificent classes of objects in the sky, giant nebulae (or giant H II regions) and globular clusters appeared to be unrelated to each other until relatively recent times. Giant nebulae like 30 Doradus in the Large Magellanic Cloud are huge volumes of gas which extend for up to one thousand light-years and are ionized by hundreds of massive young stars. Globular clusters like M13 are spherical aggregations of one hundred thousand- to one million-year-old stars packed within a few tens of light-years and with no gas around them. I will present a summary of the research that has allowed us to show that, despite appearances, giant nebulae are nothing but the birthplace of globular clusters.

Parallel Session II-A
Saturday, July 26
1:25–3:30 PM

Cosmological Darwinism and Its Discontents

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Cosmological Darwinism and Its Discontents

Since its inception, the Darwinian paradigm has provided considerable challenge for theological reflection. By purporting to explain all complex living structures via the process of replication, variation, and selection, it apparently removes the need to posit any teleological explanation of the phenomenon under consideration. The debate over this situation in the life sciences continues to be lively 140 years after Darwin's original proposal. Less well known is the application of the Darwinian paradigm to cosmological development. Originated about ten years ago by Lee Smolin, in this context the universe itself is hypothesized to be a self-replicating structure. I shall discuss the application of the Darwinian paradigm to cosmology, highlighting both the challenges that cosmological Darwinism presents to Christian theology, and the responses to it that Christian theism might provide.

Parallel Session IV-C
Sunday, July 27
1:00–3:15 PM

An Evaluation of Some Religious Perspectives on Stem Cell Research

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An Evaluation of Some Religious Perspectives on Stem Cell Research

In *When Science Meets Religion*,[1] Ian Barbour outlines four distinct relationships between the general fields of science and religion. This paper explores the possibilities that these categories could be helpful for developing a Christian perspective on current developments in the field of stem cell research. First, this paper presents Barbour's four possible relationships between science and religion as they could be articulated in the context of bioethics. Second, it considers which of Barbour's models are being forwarded in three existing discussions of Jewish, Catholic, and Protestant perspectives on stem cell research. This section of the paper will provide insight concerning how this relationship has been envisioned. The information for our appraisal will come from a variety of sources, including statements made by religious leaders before the National Bioethics Advisory Committee and a collection of essays compiled in *Caring and Curing: Health and Medicine in Western Religious Traditions*.[2] Finally, this paper will present an evangelical theological appraisal of stem cell research as it might be crafted if Barbour's model were introduced as a structural resource at the outset of the evaluation. Thus, the paper will have three sections: Barbour's models in general, Barbour's models as lenses for evaluating three religious perspectives on stem cell research, and an introductory approach to developing an evangelical perspective on stem cell research using Barbour's model as its major structural resource.

[1]Ian G. Barbour, *When Science Meets Religion* (San Francisco: Harper, 2000).
[2]Ronald L. Numbers and Darrel W. Amundsen, eds., *Caring and Curing: Health and Medicine in the Western Religious Traditions* (Boston: Johns Hopkins University Press, 1998).

Parallel Session IV-B
Sunday, July 27
1:00–3:15 PM

The Divinity of the Starry Heavens and the Origin of the Copernican Revolution

Thomas J. McLaughlin

The Divinity of the Starry Heavens and the Origin of the Copernican Revolution

According to Christian faith, the starry heavens were created by God and exist in dependence upon him, although God in no way depends upon the starry heavens. The Christian doctrine of creation and of God as Creator is opposed to a belief common to nearly all other ancient civilizations: the belief that the starry heavens are divine or that the celestial bodies are gods. Christianity helped give birth to modern science by freeing human beings from such a belief and by providing an understanding of creation favorable to scientific investigation of the heavens. In defending this view, I will first consider beliefs about the starry heavens characteristic of the Egyptians, Babylonians, Mayans, and the Chinese. Second, I will examine the most striking exception to the

ancient world's general belief in the divinity of the starry heavens: the Israelites. Third, I will argue that the European origin of modern science supports the claim that Christianity helped give birth to modern science. Fourth, I will argue that the failure of science to successfully develop among the Greek and Islamic societies supports my overall claim. Finally, I will argue that the claim that it was modern science that freed humanity from a belief in the divinity of the starry heavens is historically inaccurate. For when the Psalmist writes that the heavens declare the glory of God, he is saying, in opposition to nearly the entire ancient world, that the starry heavens are not God, are not divine, and are not divinities. It is that faith that is revolutionary and that ultimately helped give birth to modern science.

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Science and the Local Church: Confrontation, Avoidance, or Engagement

Parallel Session V-D
Monday, July 28
9:00–10:45 AM

Science and the Local Church: Confrontation, Avoidance, or Engagement

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Those individuals who have been drawn to the scientific disciplines, and who are active members of their church communities, often find themselves at the focus of long-standing "science/faith" conflicts. Simplistic dichotomies and uncompromising stands by local and national religious leaders have made it increasingly difficult to engage the issues with the depth and mutual respect required. Within local church communities there is commonly a lack of the necessary scientific and theological expertise to profitably address contentious issues, or even to recognize the fundamental questions involved. In this context, those Christians who are trained scientists often seem to face the unpleasant choice between confrontation and simple avoidance. For the Christian, the pursuit of a scientific understanding of that which God has made and entrusted to us is a religious calling. Part of that calling is to exercise our knowledge and training for the good of the Church. There is thus the responsibility to communicate the perspectives gained by the scientific disciplines to the Church in a way that can be heard and applied. This requires a commitment to extended, serious, and respectful dialogue. One-time talks or debates are not the solution. Gaining first the respect, if not the agreement, of the local church leadership will enable more productive interactions with the larger faith community. Whether interacting with a single individual or a large audience, we must be willing to directly and forthrightly address the central theological issues that typically lie at the foundation of assumed science/faith conflicts. We need not have all the answers, but we should be well aware of the questions.

Dynamics of the Oort Comet Cloud, with Impact on Terrestrial History

Parallel Session V-A
Monday, July 28
9:00–10:45 AM

Dynamics of the Oort Comet Cloud, with Impact on Terrestrial History

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While Newton's expression for gravity is simple, the range of behaviors obtainable in a system with many bodies is surprisingly rich. One interesting example are the countless planetesimals (from which the planets formed): among those that did not end up in planets, some were flung into the sun, while others were ejected from the solar system altogether. Through complex interactions, another group (the Oort cloud) moved out to the edge of the sun's domain, almost halfway to the nearest stars. The vast majority of Oort objects are effectively invisible, but gradual perturbations due to galactic tidal forces, send a number of them into the neighborhood of the planets each year. Most of these get no closer than Jupiter before being deflected away, sight unseen. Nonetheless, those few that come from furthest out (and so have received the greatest tidal torque) reach the neighborhood of the Earth and are observed as comets. The distribution of comet orbital parameters provides tests of models of the formation and development of the Oort cloud. Oort cloud objects might also be perturbed to Earth-crossing orbits by interactions with passing stars or undiscovered, massive planets. In this talk, I will present new computations for the observational signatures of such interactions. I will also draw conclusions from existing orbital data about whether the predicted signatures are observed. Finally, I will comment on the larger context of this subject: the probabilities of collisions with Earth during star-induced comet showers and the consequences for life on Earth such as mass extinctions.

Sensitive VLBI Observations of Interacting/Merging Galaxies

Poster Session
Sunday, July 27
3:30–5:00 PM

Sensitive VLBI Observations of Interacting/Merging Galaxies

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Very long baseline interferometry (VLBI) is one of the few techniques capable of revealing the highly obscured innermost regions of luminous and ultra-luminous infrared galaxies (LIRGs and ULIRGs) in the nearby universe, at very high angular resolutions. These IR sources may hold the

key to understanding two important astrophysical phenomena. One is the galactic merger environment in which a significant fraction of the stars in the universe likely formed. The other is the evolutionary connection between galaxy mergers and AGNs. Here, we present sensitive VLBI results on two IR galaxies, the ULIRG IRAS 17208-0014 and the LIRG NGC 7674. The galaxy IRAS 17208-0014 is an advanced merger system. Our high-resolution (36x33 mas) continuum images at 1.36 GHz reveal the details of an extreme nuclear starburst in this galaxy. Several compact sources are detected and presumed to be clustered supernova remnants and/or luminous radio supernovae. A very wide HI absorption line is associated with this galaxy. The HI results suggest the existence of a rapidly rotating disk feeding the nuclear starburst region. The images of NGC 7674 at 1.38 GHz and 20 mas and lower resolutions, reveal previously undetected complex jet structures in the nuclear region of this galaxy. At 11x5 mas resolution, several high brightness temperature compact sources can be seen in the central region of NGC 7674. One of these sources is a possible candidate to host an AGN. Several HI absorption features with optical depths < 0.4 are seen toward both compact and extended continuum sources in this galaxy.

Parallel Session I-B
Saturday, July 26
11:00 AM–12:15 PM

The Cosmology of Genesis One

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The Cosmology of Genesis One

This is an analysis of the cosmology (the primary structures of the cosmos) of Genesis One, in particular, the comparison between sun and moon being in charge of the sky, and humanity being in charge of the earth. This suggests that Sun and Moon are seen as conscious. I will argue that an ancient reader would see it so. This is contrary to the usual interpretation. Other points include the nature of evil and the place of humanity in the scheme of things.

Parallel Session I-A
Saturday, July 26
11:00 AM–12:15 PM

Chiasmic Cosmology and Scientific Cosmologies

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Chiasmic Cosmology and Scientific Cosmologies

Chiasmic cosmology is a project of viewing the world studied by science in the light of the cross. (The term comes from Plato's description of the World Soul "placed … crosswise [*echiasen*] in the universe" which Justin Martyr understood as a prophecy of the cross of Christ.) It is Cosmology with a capital C, the Christian context within which any scientific cosmology with a small c is to be viewed. In this paper, we will consider some scientific cosmologies of the past century in the light of God's revelation in the cross and resurrection of Christ and a model of divine action which that revelation suggests. Our point is not to see the Christian world view as a competitor with scientific theories (as is the case when the early chapters of Genesis are read as scientific accounts) but to consider the extent to which these theories may help us better to understand faith statements concerning the creation and consummation of the world. We will comment here on Milne's kinematic relativity, classical big bang and steady state theories, quantum universes, and recent models suggested by Hawkings and Hartle, Linde, and Steinhardt and Turok. Attention will be given to the distinction between cosmological models and the real universe and to the ways in which different theories deal with the ideas of a temporal origin and/or end of cosmos and the significance of history.

Parallel Session II-B
Saturday, July 26
1:25–3:30 PM

Where Do the Angels (et al.) Fit In?

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Where Do the Angels (et al.) Fit In?

Most discussions of God's action in nature since about 1900 have ignored the matter of angelic activity, perhaps in reaction to Andrew Dickson White's *Warfare of Science with Theology in Christendom*. Here we take another look at the biblical and scientific data in the light of recent interest in intelligent design.

Parallel Session III-B
Saturday, July 26
4:00–5:45 PM

Divine Action in Nature: Visible Only through Faith

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Divine Action in Nature: Visible Only through Faith

Natural revelation speaks in several ways. By metaphor, it helps us to comprehend spiritual constructs such as purity, majesty and beauty. By the nature of what was created, God reveals his attributes. By the structure and laws of nature and by personal experiences, God provides proof of his presence and divinity. Regarding proof of God, convincing scientific evidence or documentation of divine action does not at this time exist. There are theological reasons to believe that this absence of evidence is consistent with God's nature and working. This is not to say that divine action is absent or hidden in the vagaries of the quantum world, but rather that it can only be perceived and

understood through faith and the work of the Spirit. Efforts to prove or document God's action in nature have historically been scientifically dubious and theologically misguided. Current efforts demonstrate this same risk.

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The Order of Nature, Human History, and Natural History

Parallel Session III-B
Saturday, July 26
4:00–5:45 PM

The Order of Nature, Human History, and Natural History

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This paper begins with the contention that contemporary science does indeed give us good inductive reason to suppose that there are no "gaps" in the order of nature. The thesis of the paper is that there is no conflict between a "gapless" order of nature and divine action in the world. It builds on a distinction between the order of nature on the one hand and human and natural history on the other. After arguing that an absence of gaps in order of nature ought not to be at all surprising from the perspective of Christian belief about God, it is argued that there is no strong inductive argument from a gapless order of nature to the claim that miracles never occur in history, at least not if one thinks there is any reason at all to suppose that God may exist. This follows from the failure of such an inference to meet one of two conditions that any strong inductive inference must meet. (Strong inductive inferences need to be based not only on a plausibly relevant similarity; they need to be free of any plausibly relevant dissimilarities.) The paper will point out how God's activity in the world need not be restricted to obvious miracles. It will conclude with reflections on the relevance of the order-of-nature/history distinction to the question as to whether and how God may have acted in natural history.

A Layperson's Introduction to the Big Bang

Parallel Session I-A
Saturday, July 26
11:00 AM–12:15 PM

A Layperson's Introduction to the Big Bang

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This is a popular level talk that introduces laypersons to the history and the science of big bang cosmology. I begin with the work of Slipher, Hubble, and Humason on the observational side, and tie it in with Einstein's theoretical work as expanded by Friedmann, Lemaitre, and DeSitter. All this work pointed to a universe that is expanding, thereby implying a beginning. The talk examines the work of Gamow, Alpher, and Herman; they were the first to predict that the universe should be bathed with microwave radiation, which is a thermal echo of the big bang. The COBE satellite of the late 1980s and early 1990s picked up this radiation, along with the variations that point to an inflationary beginning to the universe. Other experiments—such as BOOMERANG, DASI, MAXIMA, and MAP—have extended COBE's results such that now there is ample evidence for a flat, inflationary universe whose expansion rate is increasing.

Does the Big Bang Strongly Support Creation *Ex Nihilo*?

Parallel Session II-A
Saturday, July 26
1:25–3:30 PM

Does the Big Bang Strongly Support Creation *Ex Nihilo*?

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A common theistic argument is the cosmological argument for God from the Big Bang singularity, which is taken to correspond to divine creation *ex nihilo*. While Big Bang cosmology fits the empirical data rather well, this argument is surprisingly weak because it relies on the extrapolating the model past the data into a neighborhood of $t = 0$. Three arguments call into question the support that the Big Bang singularity gives to the doctrine of creation *ex nihilo*. First, many theoretical physicists agree that, a priori, the Big Bang singularity should be construed as evidence of incomplete physical understanding, just because a truly satisfactory physical theory would not form singularities. Thus, to argue for God from the Big Bang might be to rely upon just that sort of gap that physicists are rightly in the business of closing. Second, a posteriori, at any given time there are tentative proposals for removing the singularity by subtle changes of theory, so the applicability of the general relativistic singularity theorems is not airtight even at the classical level. Finally, and most importantly, purely on dimensional grounds, one expects that quantum gravitational effects will become important in the early universe, so classical general relativity is almost certainly wrong near the ostensible singularity. Moreover, recent results suggest that quantum gravity might indeed remove the singularity, as has long been suspected. Claims that Big Bang cosmology strongly supports creation *ex nihilo* are therefore premature at best.

Radical Centrism and the Redemption of Secular Philosophy

Parallel Session V–B
Monday, July 28
9:00–10:45 AM

Radical Centrism and the Redemption of Secular Philosophy

Ernest N. Prabhakar

The harmonization of Hebrew theology with Greek philosophy was the crowning intellectual achievement of medieval Christianity. Tragically, the modern age birthed from that synthesis has lost that harmony: modern culture is almost completely dominated by purely secular ideologies,

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particularly the economic philosophies of socialism and capitalism. Even Christians, both conservative and liberal, are often influenced more by "baptized" versions of those world views that by genuine biblical understanding. I believe the solution to this problem is not to impose theocracy on an unwilling populace, but to redeem secular philosophy without losing its essential character. The first step is to recognize that philosophy—"how we think about how we think"—may be considered a manifestation of the Law, and thus can be articulated on the basis of General Revelation. The second step is to construct a philosophical framework that incorporates the best of both the right and left, yet is solidly rooted in scriptural principles—an approach I call Radical Centrism. The final step is demonstrating how this framework can improve upon current paradigms to illuminate issues of ethics, economic development, evangelism, science and faith dialogue, and other intersections between Christianity and culture.

Poster Session
Sunday, July 27
3:30–5:00 PM

Genomic Tricks

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Genomic Tricks

The neo-Darwinian theory of evolution is built upon the central dogma of molecular biology which states that information flow is unidirectional from DNA to RNA to protein. Random, gradual mutations combined with Darwinian natural selection have been the standard model of evolutionary theory since the early part of the twentieth century. And since the discovery of DNA in 1953, the mutations have been ascribed to random copying errors of the DNA. But now the central dogma of molecular biology is defunct. Ninety percent of the human genome is found to be the product of reverse transcriptase, the protein that synthesizes DNA from an RNA template. A genetic framework has been discovered in bacteria that enables the horizontal transfer of DNA segments. And changes that appear in the DNA are found to be not so random, but constrained to favor specific sequences. Furthermore, a bacterial genome is suspected to have survived for hundreds of millions of years. Rather than relying on random changes, genomes apparently have a few tricks in store to alter the genome when it is advantageous. With the discovery of molecular machinery that promotes changes in certain directions, the genome has the appearance of having been designed to evolve. In my presentation, I will investigate the tricks of the genome, and how they relate to the downfall of neo-Darwinism.

Parallel Session II-B
Saturday, July 26
1:25–3:30 PM

A Geometric Basis for Divine Action in the World

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A Geometric Basis for Divine Action in the World

How is it physically possible for one whom we cannot detect with our senses, or even with any instruments which extend our senses, to make real physical changes in the actual physical world? If God is a Spirit, how can he possibly affect the physical world? The physical world as we know it is three-dimensional: physical objects have length, width, and height. But if God exists in more than three dimensions, he would be quite real, but invisible to us. The simplest way to look at this would be think of God as existing in four physical dimensions, though he created a universe of three dimensions. We cannot, apart from mathematical abstraction, think in four dimensions. We can however consider a hypothetical two-dimensional world and compare it with the real three-dimensional world in which we live. A three-dimensional individual could stand beside the two-dimensional world, be invisible to the two-dimensional creatures, and yet be in a position to influence individuals and events taking place in that two-dimensional world. In an analogous fashion, God in four dimensions could be quite real and without being seen, could influence life and events in our present three-dimensional world.

Parallel Session V-A
Monday, July 28
9:00–10:45 AM

Dark Matter in Galaxies

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Dark Matter in Galaxies

As recently confirmed by the WMAP cosmology probe, the universe is thought to contain vast quantities of exotic invisible matter that outweighs normal matter by a large factor. This "dark matter" has driven the evolution of the smooth featureless gas of the early universe into the complex web of galaxies and clusters of galaxies that we see today. By investigating the spatial distribution of dark matter relative to present-day galaxies, we cannot only establish the intrinsic makeup of galaxies, but also indirectly determine the properties of dark matter. Currently, the only way of detecting dark matter is via its gravitational influences. For example, by measuring the orbital speeds of luminous matter in galaxies, one can infer how much total mass is present, and look for any discrepancies with the amount of known visible matter. Such studies in the 1970s of rotational speeds in spiral galaxies found that these galaxies are surrounded by large "halos" of dark matter

extending far outside their visible disks. In the current paradigm of galaxy formation, such dark halos should also be present around the common breed of elliptical galaxies. But empirical constraints on ellipticals' masses have been much less forthcoming, until now, with the advent of a new array of methods—among them gravitational lensing, X-ray emission studies, and kinematical measurements of extragalactic globular clusters and planetary nebulae. I will give an overview of recent results from these methods, including my own work with kinematics, which suggests that surprisingly little dark matter is present in average elliptical galaxies.

Writing That Connects

Parallel Session III-D
Saturday, July 26
5:15–5:45 PM

Writing That Connects

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Specialists and professionals, in the sciences as in other fields, often face a challenge in writing for students and general readers. It is not easy to express complex ideas and concepts in terms nonspecialists can understand. Yet we try to do exactly that because as members of the American Scientific Affiliation we desire to nurture the Church and lay Christians on matters where faith and science intersect. William Zinsser, one of America's foremost teachers of writing, says: "It's not necessary to be a 'writer' to write well." That's encouraging to hear! So how does one do it? In my forty years as an editor and writer, dealing with both general and academic books, I have worked with various authors who knew well how to bridge the gap. Knowing some basic principles of writing and keeping a clear focus on your intended readers can make a difference. Illustrative examples from academic works show us how and how not to write. We can all achieve what Einstein did. No, I am not referring to the Nobel Prize. I am referring to the writing in his book *Relativity: The Special and the General Theory*. The blurb on the cover of one edition says: A CLEAR EXPLANATION THAT ANYONE CAN UNDERSTAND. Really? The fact is, as Zinsser puts it: "If clear writing is clear thinking, a mind clear enough to think of the theory of relativity would be likely to express itself simply and well." That is our challenge.

Two Modes of Divine Action in History

Parallel Session II-B
Saturday, July 26
1:25–3:30 PM

Two Modes of Divine Action in History

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During history in the Bible, divine action is usually natural-appearing and occasionally miraculous-appearing. It seems reasonable to expect—unless there is strong counter-evidence—that both modes of action are still used now, and were used during the formative history of nature. For a theist, "natural" does not mean "without God" (because God designed and created nature, and constantly sustains nature); nor does it mean "without control" (because God can guide nature so that one natural result occurs instead of another).

Applying these principles leads to interesting perspectives on important questions. Although theistic evolution can be an authentically theistic creation theory, we should ask these questions: To make it theistic rather than deistic, what views of natural process are required? Is a sustaining of nature sufficient, or is a divine control of natural processes also necessary? Is a theory of creation by miraculous-appearing genetic modification, analogous to the healing in Acts 3, a theologically and scientifically plausible theory? Why isn't divine action more obvious more often? To avoid a reinforcement of the unfortunate assumption that natural process occurs without God, should we avoid a "natural versus supernatural" dichotomy, and avoid the use of "naturalism" to mean "a universe without God"? Since we want to minimize confusion and miscommunication, and "God of the gaps" has many possible meanings, should we eliminate this confusing phrase from our vocabulary? What important practical implications does a supernatural control of natural process have in daily life.

Dimensions of the Human Being and of Divine Action

Parallel Session III-B
Saturday, July 26
4:00–5:45 PM

Dimensions of the Human Being and of Divine Action

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Humans as biochemical entities can be scientifically described. Their biological behavior may be modeled in terms of information systems, built by their genomes, containing regulatory loops. In "higher" animals and humans, the goals for their behavioral regulators are not genetically fixed, but set by an adaptive internal supervisory system. This may be the operational core of what we experience as consciousness and call "soul." A dualism separating body and soul is usually rejected in both neuropsychology and theology. Furthermore, the human regulatory system is embedded in a still higher one, called "spirit," including self-consciousness and conscience, providing goals for achieving not only emotional, but spiritual behavior. So, we have a three-dimensional,

body-soul-spirit, human being, but still a unitary, indivisible person. No reductionism of spirit to soul and soul to body is implied. Each human individual is created by God. Yet each one grows out of a natural conception. The Creator's activity may be modeled as guiding natural growth processes in the physical, sentient, and spiritual realms. This Divine action need not be seen as interventions overpowering natural processes. Instead, it may represent his using options of selecting the outcome of elementary quantum events or at other bifurcations not physically specified, such as mutations or neural modifications—what science correctly describes as random events. This hidden feeding-in of formative information would represent the fundamental novelty implied by "creating."

Poster Session
Sunday, July 27
3:30–5:00 PM

Selection and Analysis of Escape Variant Mutations Affecting Epitope I of the Simian Virus 40 Large Tumor Antigen

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Selection and Analysis of Escape Variant Mutations Affecting Epitope I of the Simian Virus 40 Large Tumor Antigen

The Simian Virus 40 Large Tumor Antigen (SV40 T ag) contains four distinct epitopes, I, II/III, IV, and V, that are individually recognized by one or more H-2b-restricted cytotoxic T lymphocyte (CTL) clones. The SV40 T ag induces cellular immortalization and tumor formation by functionally inactivating multiple cell cycle regulatory proteins. Epitopes within the T antigen also induce CD8+ T lymphocyte responses that can effectively control the growth of T antigen-expressing tumors *in vivo*. We are interested in how mutation of these individual epitopes will allow for the survival of T antigen-expressing tumors in the presence of CD8+ T cell populations focused primarily on a single epitope. Escape variant populations have been selected by repeated exposure of T antigen transformed cells to the epitope I specific CTL clone, K-11, under conditions where the independence of individual mutations could be assured. Variant epitope sequences were amplified by PCR, individual amplification products were subcloned to generate recombinant libraries, and the nucleotide sequences of the epitope regions harbored by multiple, randomly chosen recombinant plasmids were determined. The results of this study will be discussed in light of previous epitope I selections.

Poster Session
Sunday, July 27
3:30–5:00 PM

Solution of Physics Puzzles Using Double-Universe Symmetries

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Solution of Physics Puzzles Using Double-Universe Symmetries

Since cosmology envisions a unique object immune to experiment, a theory has to win confirmation by coherence not prediction and gain visualizability by symmetries both numerical and geometrical. Worm-holes and multi-universes must give way to exactly two universes considered by concurrence and three arising sequentially. The former expand and contract in counterpoint. Our twins, bring "compactified" by General-Relativity curvatures, escape detection. Jordan, while considering detached globs as cross-sections through a four-space universe, saw two such globs as whole universes, and derived them from Einstein's equations as generated by reifying *both limbs* of the parabola of revolution. Following Penrose's black-hole geometry, we can recognize the three universes as near-Euclidean spaces all asymptotically tangent to the same skinless 2-sphere which, in the perspective of one plunging in, becomes a sheer point. Minkowski cones tip as they get closer to such a hole while approaching *c*; and in so doing they absorb one dimension of space. It takes exactly three universes to absorb in succession all three such dimensions. Thus, both string and Kalusa-Klein theory hypothesize (3 x 3) + 1 dimensions. As for charge/parity/time invariance: charge distinguishes between ingress and emergence; parity-reversal reflects transit through an Einstein-Rosen bridge; and time advances two-dimensionally. High-energy physics provides a different generation of particles for each universe. And a Möbius-like, single-surface re-entrant geometry (that of the projective plane) explains ½-spin as two times around for return to square A. Dirac's $\kappa \rho c^2 A^2$ suggests that the Universe is made out of nothing since it reduces to $GM^2/R = Mc^2$.

Poster Session
Sunday, July 27
3:30–5:00 PM

A Mechanical-Engineering Analysis of the Early Earth and the Days of Creation

A Mechanical-Engineering Analysis of the Early Earth and the Days of Creation

When the earth was 5000° Fahrenheit all of its water was in the form of superheated steam rising several miles above the earth. The weight of this steam produced a pressure of 3000 psi on the nitrogen below which compressed it to a column 50 feet high. Then, at the outer atmosphere the steam was radiating heat to outer space, which had an effective temperature of 450° below zero. Also, the steam which had been heated by the hot earth rose upward and experienced a pressure drop from 3000 psi to near zero. Based on the gas laws, this huge reduction in pressure produced

a correspondingly drastic reduction in the temperature of the rising steam. Due to these two effects, the steam at the outer edge of the atmosphere condensed into liquid water, which then fell as rain. But, when this rain fell nearer to the hot earth it was again boiled into steam and it rose upward, thus producing a repeating cycle. But after the earth cooked down to 695° Fahrenheit it was not hot enough to boil off the raindrops and some of them fell to earth and began to fill the ocean.
The weight of the steam and the rain was consequently reduced, and this enabled the nitrogen to expand and form a gaseous firmament between the ocean and the rain. We then had a "firmament" which divided the "under" waters from the "above" waters, i.e. the biblical second day. Boiling waters can also explain the other days of creation.

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Evidence for Design in the Human Body

Poster Session
Sunday, July 27
3:30–5:00 PM

Evidence for Design in the Human Body

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The human body is an amazingly complex structure that has been explored and researched for centuries. Yet even as we learn more about the body's intricate design, the idea of a designer seems less compatible with the modern scientific world view. The evidence for a designer is inherent in the design of the human body. There can be no creation without a creator, and we as humans are the most spectacular creation ever made. It is the goal of this project to explore several aspects of the human body and how they point to an intelligent creator, not a random series of events.
The structures investigated will include the eye, coccyx, appendix, DNA, esophagus and integument. Many evolutionists think that the process of natural selection has led to many less-than-optimal, or even useless, designs in the human body. However, when examined carefully, the reasons for each supposed "design flaw" can be seen. Some proponents of evolution will even go so far as to suggest better designs for human systems. But these designs do not work as well as one might think. Close examination of the evidence that is currently available leads to the conclusion that there must be a designer behind the human design.

Origins and Designs

Poster Session
Sunday, July 27
3:30–5:00 PM

Origins and Designs

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God created humankind from Adam and Eve, who represent a group of individuals. God created them with his spiritual and mental abilities. He created human souls before creation and breathed them into nonhuman primates to create human beings. These living souls were uniquely given intellect, free will, self-awareness, consciousness of others, dignity, conscience, purpose, responsibility, and self-control. God then gave humans knowledge to implement the potential to choose. Only with knowledge could humans conceive of evil in God's very good creation. Evil could not exist in a creation where nonhuman members had no ability to comprehend the concept. Without knowledge from Eden's "tree of knowledge," nonhuman primates could not become human. God gave them that "knowledge of everything" to become human and have the ability to choose. Without knowledge, nonhuman life cannot suffer and comprehend that its existence is meaningless. That life cannot know evil, making it innocent and sinless; it exists in paradise. Humans equipped with knowledge to make choices can never live in paradise. They understand that the world's evil results from human behavior, from human choices. Evil results from "sin (which is) explicable as an evolutionary survival from man's animal origin." Humans can choose to rule their lives using God's gifts of soul and reason or choose to be ruled by their nonhuman instinctual remnants. Any evolutionary process God uses to create takes nothing away from his revelations of who he is and what he has done.

Snark or Boojum?
Trends in the Integration of Psychology and Christianity

Parallel Session V–B
Monday, July 28
9:00–10:45 AM

Snark or Boojum? Trends in the Integration of Psychology and Christianity

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Lewis Carroll's quirky poem "The Hunting of the Snark," tells the story of a hunting party comprised of men who are in pursuit of a fantastic beast known as the Snark. There are a variety of Snarks, which are prized and valued by our good hunters. It should be noted, however, that while the Snark is prized, some Snarks are Boojums. Finding a Snark is delight, but finding a Boojum is fatal. In Frank Beach's landmark paper over fifty years ago, "The Snark was a Boojum," Beach addressed the concern that comparative psychologists set out to study animal behavior and ended up focusing not on a number of species across which comparisons were made, but on a single model: the albino rat. He argued that comparative psychologists were not doing the very thing that they set out to do: study differences and similarities in the behavior of various species. Over the past twenty

years, Christian psychologists have set off on a quest to find their Snark: the integration of psychology with Christianity. As Christians in psychology have exerted a great amount of effort into developing theoretical models designed to integrate Christian theology with their discipline, a question similar to that posed by Beach fifty years earlier can be raised in this process: Is integration a Snark or a Boojum? An analysis of articles from the two major periodicals geared toward this integration process will be presented addressing the success of Christian psychologists in the integration process.

Plenary Session
Sunday, July 27
7:30–8:45 PM

The Magnificent Worlds of Jupiter

Eilene Theilig
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The Magnificent Worlds of Jupiter

Like a miniature solar system, planet-sized moons and dusty rings orbit the giant planet Jupiter. Since its discovery by Galileo Galilei in 1610, the Jovian system has fired our imaginations, challenged our world views, inspired voyages of exploration, and revealed the rich diversity of creation. NASA's Galileo mission with its atmospheric probe and long-lived orbiter is the most recent step in exploring this king of planets. Launched in 1989, the spacecraft arrived at Jupiter on December 7, 1995. Upon arrival, the probe entered Jupiter's atmosphere, descending to the 23-bar level and relaying its data to the orbiter passing overhead. In the ensuing seven and one-half years, the twelve science instruments on the orbiter studied the planet, its magnetosphere, and satellites.

The four major moons, Io, Europa, Ganymede, and Callisto, are each distinct worlds that rival their cousins, the terrestrial planets. Rocky Io is the most volcanically active body in the solar system, producing more magma each year than the Earth. The other three are composed of rock and ice mixtures and likely harbor subsurface layers of salt water. Europa may contain more water beneath its frozen crust than all of the Earth's oceans combined and is a prime target for the search for extraterrestrial life. Extensive fracture systems thousands of kilometers long crisscross Europa and Ganymede and may contain material oozed up from the liquid layers below. The surface of undifferentiated Callisto is saturated with impact craters and shows no evidence of volcanism or tectonism. Four smaller moons, inside of Io's orbit, are intimately linked to ring formation.

Parallel Session V-D
Monday, July 28
9:00–10:45 AM

Presenting Cosmology to a Local Church

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Presenting Cosmology to a Local Church

Discussing cosmology in church can be controversial at best. However, it is possible to introduce a congregation to the wonders of the universe without being stoned as a heretic. I have developed a presentation which was delivered to approximately sixty members of the Lawrence Wesleyan Church in Lawrence, Kansas, in October 2002. The presentation's focus is the physical size of our universe. In order to describe the vastness of our universe, we take a tour from our own town to the edge of the visible universe. Along the way I display "pretty pictures" of the planets, nebulae, galaxies, clusters, etc. that we pass on our journey. At each step, I give the distance we have traveled and the time it would take traveling at the speed of light. In addition, I point out physical characteristics which make our existence possible. In the end, I wrap up with three conclusions: (1) God is big! (2) He is wise, powerful and full of knowledge; and (3) He cares about us! With these conclusions (and as an introduction to the talk) I display several related Bible verses. The response to this presentation was overwhelmingly positive. Throughout the talk I had many good questions. I consciously did not bring up the age of the universe, but did have questions along those lines. There were, however, no threats of lynching. Overall, I think that using the discoveries of modern astronomy and cosmology to glorify God was quite disarming and ignited the interest and imagination of everyone present.

Parallel Session II-A
Saturday, July 26
1:00–3:15 PM

Nothing New Under the Sun: An Analysis of Steinhardt and Turok's Cyclic Universe Model

Brian C. Thomas
see above

Nothing New Under the Sun: An Analysis of Steinhardt and Turok's Cyclic Universe Model

In a recent paper in Science, entitled "A Cyclic Model of the Universe," Paul Steinhardt and Neil Turok propose a new model of an oscillating, infinitely old universe. Such models have been around since the beginning of modern cosmology, but were effectively ruled out decades ago. This new model purports to solve the problems which plagued the original models and also includes a natural explanation for the mysterious "dark energy" which we now believe dominates the energy budget of the universe. In this talk, I will discuss past oscillating universe models and reasons for their demise. I will then present an overview and explanation of Steinhardt and Turok's new model

at a nonspecialist level and address the question of whether this model avoids the problems of past models. Finally, I will offer some thoughts and comments on how we as Christians should deal with models of the universe which remove the beginning.

A Scriptural Star Trek?

Parallel Session I–B
Saturday, July 26
11:00 AM–12:15 PM

A Scriptural Star Trek?

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How did ancient Hebrews and early Christians understand the stars? What was their trek in understanding the cosmos? What does the literary journey in their Scriptures provide to modern scholarship? Judeo-Christian canonical literature reflects contextual cultural influences in a progressive understanding of astronomy and cosmology. Contemporary Christian scholars may apply this principle in relating Christian thought to astronomy and cosmology. This paper creates a linguistic, archeological "dig" into biblical texts dealing with the cosmos and astronomy. The isogeny of biblical texts provides insight into a progressive understanding of the universe. Ancient Hebraic and early Christian sacred literature is studied in light of the Judeo-Christian background. Scriptural references to the constellations and time are highlighted to indicate the progressive nature of their knowledge of astronomy and the cosmos, as they wended their way through the ancient cultures of the Egyptians, Babylonians, Persians, Greeks, and Romans. Exegetical studies in original Hebrew, Greek, and Latin texts validate evidence of this growing knowledge among the Hebrews and Christians. This "Scriptural Star Trek" provides modern scholars with a pervading principle to relate Christian thought to the cosmos. New scientific ideas and understanding within astronomy and cosmology may have the same influence upon Christian scholarship that the ancient Hebrews and new Christians found from their cultural and literary environment. Indeed, "The heavens declare the glory of God …"

Teaching Courses of "Astronomy and Science and Faith Issues" for Lay Audiences (Both Believers and Skeptics)

Poster Session
Sunday, July 27
3:30–5:00 PM

Teaching Courses of "Astronomy and Science and Faith Issues" for Lay Audiences (Both Believers and Skeptics)

Co-Authors
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Since most people who struggle with science and faith issues (considering science as a barrier to faith) are those who do not have much scientific background, there is a great need for Christian professional scientists to present reasons to believe in ways the lay person can understand. With this thought in mind, Marty, Jeff, Mark and I have developed courses of "Astronomy and Science Faith Issues" in two versions to be taught for both audiences of believers and skeptics.

For the believers' version, the main goals are:
- Strengthen their faith giving evidences for design
- Inspire worship through presenting the awesomeness and beauty of the Universe
- Provide tools for effectively defending their faith and making good arguments

For the skeptics' version, the main goals are:
- Break down barriers and open discussion
- Shake basis of atheism through inviting them to examine evidences of design
- Bring an evangelistic message

The courses are divided into two parts. The first part is a condensed overview of the Universe presented in an unbiased professional manner focusing on the discoveries made. The second part presents how these findings relate to the Christian faith. The course ends with a star party for fellowship and fun.

I will be sharing the course material (PowerPoint presentations and handouts saved on CD) and some encouraging results we had (the believers' version was presented in three churches).

Fine-Tuning in the Universe

Parallel Session II-B
Saturday, July 26
1:25–3:30 PM

Fine-Tuning in the Universe

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Tension: We have been arguing for years (centuries) over God's role and rule in the realm of nature. The scientific mind assumes—almost by necessity—that the chains of natural causation are not just intact—they are in fact undistorted, untwisted. Uniformity—all the way down—forms the bedrock foundation of our theorems. If the hand of God intrudes, we pray that it acts when we are not looking—when we are not standing watch on the decks of our scientific expeditions—gazing

through our instruments plotting our course. God is the ultimate in uncontrolled (and uncontrollable) variables. But God is not contained in the space-time continuum.

Resolution: A model for interaction between extra-temporal reality and the space-time continuum is proposed. The model proposes that extra-temporal causality may be more fruitfully (but still inadequately) viewed as a second temporal dimension rather than temporal stasis. An extra-temporal agent could in theory be able to act undetectably and continuously on the space-time continuum, changing its contours and outcomes, without interfering with its integral internal causality. Hence, temporal reality could be fully determined both from within and without, dual causality without conflict.

Poster Session
Sunday, July 27
3:30–5:00 PM

The Dynamics of Current Star Formation

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The Dynamics of Current Star Formation

Our universe is not stagnant nor steady-state. Recent discoveries of extra-solar planets, stars in the process of formation, galaxies at their earliest formation stage, and evidence for an accelerating expansion of the universe all show that the processes put into play "In the Beginning" are still at work creating a fruitful, active cosmos. I will present some of the latest discoveries about stars in our local Milky Way galaxy that are currently in the process of forming. These "protostars" grow as dense disks of orbiting circumstellar gas slowly accrete onto their surfaces, with some leftover material probably forming planets. Some of the accreting material is ejected along magnetic field lines from the stars' poles, creating fantastic outflowing jets of material reaching thousands of light-years into the surrounding interstellar space. I will present radio telescope images from the Very Large Array (VLA) of the circumstellar gas around several protostars, along with images from optical and infrared telescopes of the shocked light from related outflowing jets. Such discoveries show us that the processes of creation are fantastic and ongoing. Using telescopes at multiple wavelengths gives us a more complete picture of star formation processes.

Parallel Session III–C
Saturday, July 26
4:00–5:45 PM

The Environmental Litany: Do We Worry Too Much?

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The Environmental Litany: Do We Worry Too Much?

It stinks! It stinks! The whole world stinks! The environment, we have been told is getting worse all the time and doomsday is just around the corner. We have heard it so often claims Bjorn Lomborg in his book *The Skeptical Environmentalist*, that we no longer question this story. But, he claims, the problem is that the earth is actually in good shape. These ideas have stirred up a vigorous ideological exchange. And scientific journals and technical committees, such as the Danish Committees on Scientific Dishonesty (DCSD), have weighed into the debate. But this is only the latest round in a decades-old contest of ideas. It is not likely to subside very soon. So is there anything we can offer to the dynamics of these public disputes? The state of the environment raises questions of both science and policy. The answers often require both technical and interdisciplinary study. But population and climate change also raise value questions and the combination of technical and moral dimensions within interdisciplinary context presents obstacles to understanding and agreement. A new environmental rhetoric is being created that involves this moral dimension. No matter what one concludes about the real state of the earth, we remain stewards of creation. Stewardship is a rich doctrine of Scripture. We need a vision for the future that goes beyond one of secular salvation through a utilitarian process called progress.

Parallel Session II–C
Saturday, July 26
1:25–3:30 PM

Global Climate Change: A Defining Issue for the 21st Century

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Global Climate Change: A Defining Issue for the 21st Century

The United States has withdrawn from an international agreement to limit greenhouse gas emissions, the Kyoto Protocol, basing its action on the fear that conforming to the agreement would be harmful for the U.S. economy. In the meantime, scientists have reached a consensus on the issue of global climate change that is unusual in its breadth and level of commitment. They agree that it is happening already, and that the consequences will be severe. A majority of the developed nations have signed the Kyoto Protocol, and are already making progress in cutting back on their emissions. What is this consensus based on? How convincing is the evidence? What will be the consequences

if the scientists are right? For the Christian, what are the ethical and theological dimensions of this issue? If this consensus is correct, what are some ways to move forward in limiting greenhouse gas emissions and stabilize their concentrations in the atmosphere? What are some ways to mitigate the impacts of climate change? In July 2002, The John Ray Initiative and Au Sable Institute of Environmental Studies sponsored a symposium on climate change, bringing together scientists, policy-makers, and Christian leaders to examine the issue in its many dimensions. What can we learn from this symposium? Finally, what role can an environmental science text play in promoting a clear understanding of the scientific, political, economic, and ethical dimensions of global climate change?

Genesis One as a Sign of the Evolutionary Record: Art and Implications

Poster Session
Sunday, July 27
3:30–5:00 PM

Genesis One as a Sign of the Evolutionary Record: Art and Implications

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Artistic concordism is an approach to finding harmony between the biblical and evolutionary "origins stories" that does not favor one story at the expense of the other. Here, we will focus on Genesis One and follow the intuition expressed in Newman and Eckelmann's *Genesis One and the Origin of the Earth* (1977), by comparing Genesis One and the evolutionary record on the basis of natural signs. Beginning with a day-epoch correspondence similar to the mentioned work, artistic signs built as sign-vehicles from the Genesis text are brought into relation with objects in the evolutionary record on the basis of iconicity, indexality or symbolism; the three classes of "natural sign" defined by Charles Sanders Peirce, one of the founders of modern semiotics. What does the construction of a match imply? Once all the descriptive Genesis phrases are brought into relation to various aspects of the evolutionary record, the match itself becomes a sign of the single reality assumed (in an *if* statement) by artistic concordism. Because the match is artistic, the signified single reality is primarily experienced as feeling. The sign places the performer and the audience within an "origins experience," where the opening scroll once told a story that matched an ancient intuitive view of nature, but now, appears to be a sign of our modern counter-intuitive knowledge of nature.

Biotechnology and Food Security: The Ethics of Gene Power

Parallel Session III–C
Saturday, July 26
4:00–5:45 PM

Biotechnology and Food Security: The Ethics of Gene Power

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The biotechnology industry has been making some strong arguments for the necessity of agricultural biotechnology to provide for food security for the growing human population. There is indeed some real potential for increasing food production through biotechnology. These possibilities need to be pursued diligently, but carefully. Increased food production, however, does not necessarily provide for increased food security for those who are poor and malnourished. Food security for all people will require a greater democratization of control of access to food and food production. An important question for agricultural biotechnology is whether it will serve to increase access to food and food production or whether it will serve to centralize control over food and food production. Central to this issue is the question of whether the privatization of agricultural biotechnology research and intellectual property rights (patents) will lead to increase in the centralization of food power through gene power. Is the goal of food security for all people consistent with corporate control of agricultural biotechnology or will such corporate control actually hinder the development of food security? Or should ag-biotechnology research and control be in the hands of public research funds as in the research that paved the way for the Green Revolution? These are important ethical considerations that need to be addressed as we pursue agricultural biotechnology.

Local Areas Fellowship Luncheon

Sunday, July 27, 2003, 11:30 AM. Find the table marked with the number of your local area.

Table Number	Local Area	Area Conveners	Areas Included
1.	Canada/ International	Robert Mann Judy Toronchuk	–Canada, England, Norway, Switzerland, West Indies …
2.	Chicago, Greater	Marilyne Flora David Fisher	–Illinois, Iowa, Minnesota, North Dakota, South Dakota and Wisconsin
3.	Indiana/Kentucky/ Michigan/Ohio	Hessell Bouma III George Murphy	–Indiana, Kentucky, Michigan and Ohio
4.	Northeast	Ed Huff Philip Ogden	–Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont
5.	Pennsylvania	Robert Newman Frank Roberts	–Delaware, Pennsylvania and New Jersey
6.	Rocky Mountain	Terry Gray Ken Touryan	–Colorado, Kansas, Nebraska, Utah and Wyoming
7.	Southeast	Martin Price Larry Seward	–Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina and Tennessee
8.	Southwest	Fred Hickernell David Siemens	–Arizona, Nevada and New Mexico
9.	Oklahoma/Texas	Ken Dormer Don Kobe	–Oklahoma and Texas
10.	Washington, DC/ Baltimore	Paul Arveson Susan Daniels	–District of Columbia, Maryland, Virginia and West Virginia
11.	West	Ken Lincoln Jack Swearengen	–Alaska, California, Hawaii, Idaho, Montana, Oregon and Washington