ASA 2018 – 73rd Annual Meeting

BIOETHICS AND BIOTECHNOLOGY

July 27–30, 2018

Gordon College
Wenham, MA

Genesis 1:28, ESV

And God blessed them. And God said to them, "Be fruitful and multiply and fill the earth and subdue it, and have dominion over the fish of the sea and over the birds of the heavens and over every living thing that moves on the earth."

Francis Collins
Plenary Speaker

Nigel M. de S. Cameron
Plenary Speaker

Douglas A. Lauffenburger
Plenary Speaker

Noreen Herzfeld
Plenary Speaker

Jeff Schloss
Plenary Speaker

Alynne MacLean
Workshop Facilitator

S. Joshua Swamidass
Workshop Facilitator

THE AMERICAN SCIENTIFIC AFFILIATION

Leslie Wickman, Executive Director
Vicki Best, Director of Operations and Development
Lyn Berg, Managing Editor
Kristen Broughton, Membership and Outreach Manager

Contents

DoSER
Dialogue on Science, Ethics, & Religion

AAAS **Engaging Scientists**

The **Engaging Scientists in the Science and Religion Dialogue** project supports scientists in becoming more effective ambassadors for science with diverse publics, and particularly with religious individuals and communities. Ongoing project activities include workshops, symposia, university events, and media resources to encourage constructive engagement on science and technology topics. DoSER is pleased to have ASA as a consultant on the project and encourages ASA members to participate in the following ways:

Explore the
AAAS Science Engagement Toolkit
www.forceforscience.org /toolkit

Sign up for the
DoSER Newsletter
www.aaas.org/page/ doser-newsletter

Coming to science society meetings and campuses near you:
DoSER Workshops and Events
www.aaas.org/DoSER

Register for the
Engaging Scientists Network
as science ambassadors and/or community representatives
engagingscientists.aaas.org

American Association for the Advancement of Science
1200 New York Ave. NW, Washington, DC 20005 | doser@aaas.org | 1.202.326.6609 | aaas.org/doser

General Information

Exhibit and Book Room

The exhibits and book tables featuring books of interest to attendees are located in the Ken Olsen Science Center (KOSC) Loggia.

Friday:	1:00 PM – 11:00 PM
Saturday:	9:45 AM – 5:15 PM; 9:00 PM – 10:30 PM
Sunday:	10:30 AM – 5:15 PM; 9:30 PM – 10:30 PM
Monday:	9:45 AM – 11:30 AM

Plenary Sessions

The Francis Collins public lecture will be held in the A. J. Gordon Memorial Chapel. All other plenary sessions will be held in KOSC 104, MacDonald Auditorium.

Friday:	7:30 PM	**Douglas A. Lauffenburger**, "Humanizing Therapeutics Discovery"
Saturday:	8:45 AM	**Nigel M. de S. Cameron**, "A Human Century?"
Saturday:	7:30 PM	**Francis S. Collins,** "The Joyful Complementarity of Science and Faith"
Sunday:	11:00 AM	**Noreen Herzfeld**, "Cybernetic Enhancement and the Problem of the Self"
Monday:	8:45 AM	**Jeffrey P. Schloss**, "The Question of Purpose in the Living World: Does Evolution 'Lead to Love'?"

Poster Session and Viewing

will be in KOSC Walkway. Poster session is Saturday from 2:45 to 3:45 PM. Poster viewing is Saturday and Sunday.

Special Events

Friday:	5:15 PM	First-Time Attendees Dinner Meetup
	8:30 PM	Fellowship Mixer
	10:00 PM	Psalm 19 Astronomy Event
Saturday:	6:00 AM	Morning Walk
	7:00 AM	CWIS (Christian Women in Science) Breakfast Meetup
	11:45 AM	Student/Early Career Lunch Meetup
	5:30 PM	Clambake on the Quad
	9:00 PM	Coffee House with Special Music| BioLogos Reception
Sunday:	6:30 AM	Morning Walk
	7:30 AM	Engineers Breakfast Meetup
	9:30 AM	Worship Service
	12:00 PM	CSCA Lunch Meetup
	5:15 PM	Geologists Dinner Meetup
	5:30 PM	Volleyball Tournament
	6:30 PM	Softball Game
	8:15 PM	State of the ASA – Last year's highlights and exciting future initiatives
	9:30 PM	InterVarsity Reception
	9:30 PM	Ice Cream Social
Monday:	6:00 AM	Morning Walk
	7:00 AM	Breakfast Meetup: Legacy Giving Discussion

Campus ATM Machine

is located in Lane Student Center.

Campus Parking

is free, no parking passes needed.

Campus Wi-Fi network

is named "GordonGUEST." It authorizes 12 hours of use and can be renewed. Instructions at ASA table.

Campus Safety:

978-867-4444

Many thanks to ...

Program Chair **Michael Paul** and Assistant Program Chair **Tim Wallace** and Local Arrangements Chairs **Sharon Carlson** and **Susan Gross** for their countless hours of preparation.

We are especially thankful for the **donors** who contributed to the Students and Early Career Scientists Scholarship Fund.

The ASA Spirit

The ASA 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.

Pre-Meeting Activities

Wednesday, 25 July 2018		
3:00 PM–10:00 PM	ASA Meeting and Lodging Registration	Special Arrangement

Thursday, 26 July 2018		
1:00 PM–10:00 PM	ASA Meeting and Lodging Registration	Ken Olsen Science Center (KOSC) Loggia
5:00 PM–12:00 AM	Red Sox Game	Meet at the circle drive by A J Memorial Chapel

Friday, 27 July 2018		
7:00 AM–8:00 AM	Breakfast	Lane Student Center
8:00 AM–8:30 PM	ASA Meeting and Lodging Registration	KOSC Loggia
8:00 AM–5:00 PM	Exhibit and Book Room Set-Up	KOSC Loggia
8:00 AM–8:30 PM	Poster Set-Up	KOSC Walkway
8:45 AM–1:00 PM	Field Trip: MIT Lab *	Meet at the circle drive by A J Memorial Chapel
9:00 AM–12:00 PM	Workshop: Science for Service: Diagnostics for the Developing World **Alynne MacLean**, facilitator	KOSC 214
9:00 AM–1:30 PM	Field Trip: Halibut Point/Rockport Geology Tour *	Meet at the circle drive by A J Memorial Chapel
11:30 AM–1:30 PM	Lunch	Lane Student Center
12:45 PM–5:00 PM	Field Trip: Cape Ann Whale Watch *	Meet at the circle drive by A J Memorial Chapel
2:00 PM–5:00 PM	Workshop: Reworking the Science of Adam **S. Joshua Swamidass**, facilitator	KOSC 107

** Please arrive 15 minutes before departure time.*

Program Schedule

Friday, 27 July 2018		
5:15 PM 6:30 PM	Dinner	Lane Student Center
5:15 PM 6:30 PM	First-Time Attendees Dinner Meetup	Lane Student Center
7:00 PM 7:30 PM	Welcome, Introductions, Announcements • **Leslie Wickman**, ASA Executive Director • **Vicki Best**, ASA Director of Operations and Development • **D. Michael Lindsay**, Gordon College President • **Janel Curry**, Gordon College Provost • **Sharon Carlson** and **Susan Gross**, Local Arrangements Cochairs • **Michael Paul**, Program Chair	KOSC 104
7:30 PM 8:30 PM	**Plenary I** **Douglas A. Lauffenburger**, "Humanizing Therapeutics Discovery" Moderator: **Randy Isaac**	KOSC 104 (8)
8:30 PM 10:00 PM	Mixer	KOSC Loggia/Chairman's Room
10:00 PM	Psalm 19 Astronomy Event (weather permitting)	Quad
10:00 PM	ASA Meeting and Lodging Registration closes	KOSC Loggia

PLEASE NOTE: Abstracts are found on the page numbers within the parentheses.

Saturday, 28 July 2018				
6:00 AM	Morning walk led by **Davey Walters**, an award winning founding member of the Massachusetts Young Birders Club; all are welcome — Meet at KOSC Parking Lot			
7:00 AM	Breakfast — Lane Student Center			
7:00 AM	Christian Women in Science (ASA Affiliate) Breakfast Meetup—All women are invited — Lane Student Center			
8:15 AM	ASA Registration Table — KOSC Loggia			
8:20 AM	**Devotions.** Devotional: **Janel Curry** Worship Leader: **Steve Kercher** — KOSC 104			
8:45 AM 9:45 AM	**Plenary II** **Nigel M. de S. Cameron**, "A Human Century?" Moderator: **Stephen Moshier** — KOSC 104 (8)			
9:45 AM 5:15 PM	Poster Viewing — KOSC Walkway			
9:45 AM	Exhibit and Book Room — KOSC Loggia			
9:45 AM	Beverage Break — KOSC Loggia			
10:15 AM 11:45 AM	**I.A: Modern Biotechnology I** –KOSC 104 Moderator: **Craig Story**	**I.B: Digital Technology I** –KOSC 107 Moderator: **Tim Wallace**	**I.C: Evolution Pedagogy** –Jenks 237 Moderator: **Kathryn Applegate**	**I.D: Student/Early Career Track 1** –Jenks 226 Coordinators: **Tom Grosh** and **Hannah Eagleson**
10:15 AM	**Wayne K. Dawson** (11) "How Can Entropy Play a Major Role in Promoting Natural Selection?"	**Terry M. Gray** (11) "Electronic Waste (E-waste)"	**Mark A. Strand** (11) "Teaching Evolution to Young-Earth Trained High School Sunday School Students"	**Now What? Choosing Next Career Steps** (11)
10:45 AM	**Robin Pals Rylaarsdam** (12) "CRISPR Ethics: New Challenges, or Nothing New under the Sun?"	**Timothy P. Wallace** (12) "A Christian Response to the Good, Bad, and Improbable Predictions of Artificial Intelligence Futurists"	**Kathryn Applegate** (12) "BioLogos INTEGRATE: New Christian Worldview Supplement for High School Biology"	**Don't Leave Undergrad without It: Wisdom for Thriving in Science** (12)
11:15 AM	**Daniel B. Dorman** (13) "Developments in Optogenetic Neuro-modulation and Their Ethical Implications"	**Timothy Opperman** (13) "A Technoethical Approach to Original Sin: Will Robots Sin?"	**Tony Jelsma** (13) "Using a 'Reacting to the Past' Game to Teach Faith and Science in an Origins Class"	**Speed Mentoring for Undergraduates** (13)
11:45 AM	Lunch — Lane Student Center			
11:45 AM	Student/Early Career Lunch Meetup — Lane Student Center			
1:15 PM 2:45 PM	**II.A: Modern Biotechnology II** –KOSC 104 **Moderator: James Peterson**	**II.B: Engineering and Appropriate Technology I** –KOSC 107 Moderator: **Ian Hutchinson**	**II.C: Faith and Science Education I** –Jenks 237 Moderator: **George Murphy**	**II.D: Student/Early Career Track 2** –Jenks 226 Coordinators: **Tom Grosh** and **Hannah Eagleson**
1:15 PM	**Vincent Ling** (14) "Biotechnology and the Cost of Medicine: A Crisis in Pharmaceutical Innovation?"	**William Jordan** (14) "Teaching Sustainable Engineering Topics in a Required Materials Engineering Class"	**Kristen Mudrack** (14) "Chemistry and Society: Integration of Faith and Science in General Education"	**Generating Great Ideas in Academia and Science Careers** (14)
1:45 PM	**James C. Peterson** (15) "Should Caregivers Risk Their Lives for Their Patients? The SARS Epidemic in Toronto as a Test Case"	**Richard E. Denton** (15) "Communicating the Bible to All the World"	**Gladys Kober** (15) "High School Curriculum: *The Crossroads of Science and Faith: Astronomy through a Christian Worldview*—Outreach Phase"	**Networking for the Common Good** (15)
2:15 PM	**Loren A. Martin** (16) "The Coming Age of Human Life Extension: Exploration of Attitudes on Life-Extending Interventions in Separate Samples of Younger and Older Adults"	**Kirk Bertsche** (16) "An Overview of Radiation Therapy"	**Ed LaBelle** (16) "The Heavens Declare the Glory of God: Sidewalk Astronomy Evangelism"	**Speed Mentoring for Graduate Students and Early Career Professionals** (16)

Saturday, 28 July 2018

2:45 PM 3:45 PM	**Poster Session** KOSC			
	1. **Rachel Allison**, "Caring While Carrying: How Do Social and Moral Constraints Affect Physical Motion?" (30) 2. **Lian Atlas**, "$(gc)^2$: Gordon College's Commitment to Green Chemistry" (30) 3. **Andrea Casazza**, "Geology and Landscape: The Key Factors for the Inscription of the Italian Dolomites in the UNESCO World Heritage List" (30) 4. **Verna Curfman**, "How Green Chemistry Can Impact Social Justice Education" (30) 5. **Mollie Enright**, "Changing the Course of Chemistry: Adopting the Green Chemistry Commitment" (31) 6. **Fraser Fleming**, "Fostering Creativity" (31) 7. **Esita Harper**, "A Promising Virus" (31) 8. **Joanna Klein**, "A Teaching Strategy to Address Origins in a Microbiology Course for Nonmajors at a Christian University" (31) 9. **Thomas Larkin**, "Genesis and Evolution" (32) 10. **Zachary Merhavy** and **Cheney Huls**, "Antibacterial Activity of Selected Plants from Southwest USA" (32) 11. **Amanda Page**, "Using FRET to Elucidate the Lipid Trafficking Mechanism of SP-B C and N Terminal Peptides in Comparison with KL_4" (32) 12 **Grace Peppler**, "Remote Respiratory Allergen Challenge Increases the Frequency of Small Intestinal Eosinophils in Allergen-Sensitized Mice" (32) 13. **Julie Reynolds**, "For Everything There Is a Season: Molecular Regulation of Insect Diapause" (33) 14. **Daisy Savarirajan**, "Microbiology through the Lens of the Bible: Antimicrobial Products from Sonoran Desert Plants" (33) 15. **Craig Story**, "Developing Optimized Sortases for Investigating Cellular Trafficking in Animal Models" (33) 16. **Janelle Veazey**, "Protein Kinase D3 Strengthens Barrier and Mounts an Early Innate Immune Defense Against Invading Respiratory Infections" (33) 17. **Ramesh Velupillaimani**, "God's Solar Cells: Light-Harvesting Role of β-carotene in the Photosystem I of Eukaryotic *Chlamydomonas Reinhardtii* Cells" (34)			
2:45 PM	Refreshment Break KOSC Chairman's Room			
3:45 PM 5:15 PM	**III.A: The Big Picture** –KOSC 104 Moderator: **David Larrabee**	**III.B: Digital Technology II** –KOSC 107 Moderator: **Tim Wallace**	**III.C: Biology and the Problem of Evil** –Jenks 237 Moderator: **John Wood**	**III.D: Local Chapters Seminar** –Jenks 226 Coordinators: **Leslie Wickman** and **Vicki Best**
3:45 PM	**Loren Haarsma** (17) "Beyond the Free Will Defense: Natural Evil, Theodicy, and Sacrificial Love"	**Isac Artzi** (17) "Interacting with the Bible Using Artificial Intelligence and Virtual Reality"	**Oscar Gonzalez** (17) "Were Parasites Mutualistic at the Beginning?"	**Overview of Local Chapters Program** (17)
4:15 PM	**James D. Sideras** (18) "The Need for Generation Z Christian Apologetics"	**Paul H. Carr** (18) "Helping the 33%: Automation-Displaced Workers"	**John R. Wood** (18) "Wholeness and Ecosystems: The Functionality of Fear"	**Chapter Leaders Panel Discussion** (18)
4:45 PM	**David Larrabee** (19) "Being a Scientist and a Christian: Lessons from Religious Dual Belonging"	**David C. Winyard Sr.** (19) "Christianity, Transhumanism, and Techno-Syncretism"	**F. Allen Dray Jr.** (19) "Biological Control of Weeds: Reconstituting God's Plan"	**Planning Workshop** (19)
4:45 PM	ASA Registration Table closes KOSC Loggia			
5:15 PM	Exhibit and Book Room closes KOSC Loggia			
5:15 PM	Parallel Session III ends			
5:30 PM	Clambake Quad • **Leslie Wickman** and **Vicki Best** —Welcome and Prayer			
7:30 PM 9:00 PM	**Plenary III** A J GordonMemorial Chapel Welcome and Introduction: **Vicki Best and Leslie Wickman** (10) **Francis S. Collins,** "The Joyful Complementarity of Science and Faith"			
9:00 PM 11:00 PM	Coffee House | BioLogos Reception KOSC Loggia/Chairman's Room Special Music by **Francis Collins** and **Ciara Reyes**			
9:00 PM 10:30 PM	Exhibit and Book Room KOSC Loggia			

Sunday, 29 July 2018

6:30 AM	Morning walk led by **Dorothy Boorse**, wetland ecologist; all are welcome			Meet at KOSC Parking Lot
7:30 AM	Breakfast			Lane Student Center
7:30 AM	Engineers Breakfast Meetup—All engineers are invited			Lane Student Center
9:30 AM 10:30 AM	**Worship Service** Worship Leader: **Steve Kercher** Minister: **Sean McDonough**, Professor of New Testament at Gordon-Conwell Theological Seminary Offering supports **Science with a Mission, Inc.**			KOSC 104
10:30 AM	ASA Registration Table			KOSC Loggia
10:30 AM 5:15 PM	Poster Viewing			KOSC
10:30 AM	Exhibit and Book Room			KOSC Loggia
10:30 AM	Beverage Break			KOSC Chairman's Room
11:00 AM 12:00 PM	**Plenary IV** **Noreen Herzfeld**, "Cybernetic Enhancement and the Problem of the Self" Moderator: **Judith Toronchuk**			KOSC 104 (9)
12:00 PM	Lunch			Lane Student Center
12:00 PM	CSCA Lunch Meetup			Lane Student Center
1:15 PM 2:45 PM	**IV.A: Evolutionary Ideas I** –KOSC 104 Moderator: **Sy Garte**	**IV.B: Modern Biotechnology III** –KOSC 107 Moderator: **Heather Prior**	**IV.C: Faith and Science Education II** –Jenks 237 Moderator: **Michael Paul**	**IV.D: Engineering and Appropriate Technology II** –Jenks 226 Moderator: **Gayle Ermer**
1:15 PM	**Denis O. Lamoureux** (20) "Intelligent Design Theory: The God-of-the-Gaps Rooted in Concordism"	**David L. Dornbos Jr.** (20) "Transgenic Crops Perpetuate an Unsustainable and Unjust Food System"	**George L. Murphy** (20) "Teaching Faith and Science without Losing Souls"	**Gayle E. Ermer** (20) "What Does It Mean to Offer a Distinctively Christian Engineering Program? A Comparative Analysis of Program Educational Objectives"
1:45 PM	**Randy Isaac** (21) "In Defense of Theistic Evolution"	**Heather Prior** and **Christianna Czyz** (21) "Mind the Gap: Christian Faith in Decisions about Fertility Treatments"	**Dominic Halsmer** and **Philip Riegert** (21) "Science as a Mediator Between Religions"	**Jessica D. Ventura** (21) "A Low-Cost Bodyweight Support Training System to Improve Gait"
2:15 PM	**James Stump** (22) "Did God Guide Evolution?"	**Benjamin Padilla** (22) "Toward Standardization in Landscape Gradient Definition"	**Effat Zeidan** (22) "The Power of Praise and Encouragement in a Nontraditional Online Learning Environment"	**Mark McEwan** (22) "Asymmetrical Partnership: Models of Science and Religion Revisited"
2:45 PM	Refreshment Break			KOSC Loggia
3:15 PM 5:15 PM	**V.A: Medical and Clinical Issues** –KOSC 104 Moderator: **Jim Johansen**	**V.B: Culture, Science, and Faith** –KOSC 107 Moderator: **Edward B. Davis**	**V.C: Faith and Science Education III** –Jenks 237 Moderator: **Hal Poe**	**V.D: Physical Sciences I** –Jenks 226 Moderator: **Kirk Bertsche**
3:15 PM	**David Sabapathy** (23) "The Unexamined Life of Public Health"	**Edward B. Davis** (23) "How Liberal Protestants Bought White's Conflict Thesis and Lost Their Faith"	**Andrew Walsh** (23) "Beaming Science Fiction into the Science and Faith Conversation"	**Phyllida Drummond** (23) "The Problem of Faith in an Emergent World"
3:45 PM	**Jim Johansen** (24) "Insights from Sample Human Genome GWAS and Epigenome EWAS Projects"	**Arie Leegwater** (24) "Science, Culture, and Belief [Thomas Kuhn's Legacy]: Some Christian Reflections"	**Jimmy Davis** and **Harry Poe** (24) "Toward Thinking about Science from a Faith Point of View: Elements of a Strategy"	**Matthew Solt** (24) "A Brief Guide to Observing Invisible Matter"

4:15 PM	**Beate Peter** (25) "Babble Boot Camp: Preventing Speech and Language Disorders in Infants at Genetic Risk"	**Patricia Fitzgerald-Bocarsly** and **Andrew B. Bocarsly** (25) "The Science/Faith Dialogue in the Local Church: A Leap of Faith"	**Jennifer Noseworthy** (25) "Engaging Science and Faith in Core Science Curriculum at Gordon College"	**Stephen Moshier** (25) "Continents Did Not Sprint"
4:45 PM	**Breanne Parets** (26) "Physician-Assisted Suicide: An Examination of Ethics and Dignity at the End of Life"	**Walter Bradley** (26) "What, If Anything, Might Near-Death Experience Tell Us about Life after Death?"	**Walter A. Rogero II** (26) "Framing Faith and Science Conversations Effectively"	**Alan Dickin** (25) "New Geological and Historical Evidence for the Date of Noah's Flood"
5:00 PM	ASA Registration Table closes			KOSC Loggia
5:15 PM 10:00 PM	Posters taken down			KOSC Hallway
5:15 PM	Exhibit and Book Room closes			KOSC Loggia
5:15 PM	Dinner			Lane Student Center
5:15 PM	Geologists Dinner Meetup—All geologists are invited			Lane Student Center
5:30 PM	Volleyball Tournament			Volleyball Lawn Court
6:30 PM	Softball Game			Softball Field
8:15 PM	State of the ASA Presenters: **Leslie Wickman, Stephen Moshier, Vicki Best**			KOSC 104
9:30 PM	InterVarsity Reception			KOSC Loggia/Chairman's Room
9:30 PM	Ice Cream Social			KOSC Loggia/Chairman's Room
9:30 PM 10:30 PM	Exhibit and Book Room			KOSC Loggia

Congratulations, Long-Time Member Attendees!

We appreciate your faithful commitment to the ASA.

61 years

John W. Haas Jr.
Robert L. Herrmann

55–57 years

John E. Richardson
Richard T. Wright

50–54 years

David S. Barnes
Clarence Menninga
L. William Yoder

47–49 years

Ann H. Hunt
Martin L. Price
David A. Saunders
Robert E. Sundell

45–46 years

Walter L. Bradley
Russell R. Camp
Davis A. Young

40–44 years

Paul T. Arveson
Bryce A. Babcock
Lynn A. Braband
Del L. Coon
Edward B. Davis
Dillard W. Faries
Earl W. Godfrey
Randall D. Isaac
Jay L. Hollman
Robert Kaita
George L. Murphy
Ronald T. Myers
Lyle B. Peter
Willard H. Roundy Jr.
Jeffrey P. Schloss
Bruce W. Schweitzer
John R. Wood
Kurt A. Wood

Monday, 30 July 2018			
6:00 AM	Morning walk; all are welcome		Meet at KOSC Parking Lot
7:00 AM	Breakfast		Lane Student Center
7:00 AM	Breakfast Meetup: Legacy Giving Discussion with **Leslie Wickman** and **Vicki Best**		Lane Student Center
8:15 AM 10:00 AM	Lodging Check out at the ASA Registration Table (luggage storage available)*		KOSC Loggia
8:20 AM	**Devotions**. Devotional: **Robert Geddes** Worship Leader: **Steve Kercher**		KOSC 104
8:45 AM 9:45 AM	**Plenary V** **Jeffrey P. Schloss**, "The Question of Purpose in the Living World: Does Evolution 'Lead to Love'?" Moderator: **Craig Story**		KOSC 104 (9)
9:45 AM	Exhibit and Book Room		KOSC Loggia
9:45 AM	Beverage Break		KOSC Loggia/Chairman's Room
10:15 AM 11:45 AM	**VI.A: Creation Care** –KOSC 104 Moderator: **Dorothy Boorse**	**VI.B: Evolutionary Ideas II** –KOSC 107 Moderator: **Sy Garte**	**VI.C: Physical Sciences II** –Jenks 226 Moderator: **Randy Isaac**
10:15 AM	**Dorothy Boorse** (27) "Creation Care and Environmental Justice: Closing the Concern Gap in the Area of Climate Change"	**Sy Garte** (27) "Intrinsic Biological Intelligence and Design"	**Dillard W. Faries** (27) "Causality/Teleology Symmetry in Quantum Mechanics"
10:45 AM	**Robert D. Sluka** (28) "An Ocean of Plastic Hope"	**David Buller** (28) "Evolution and the Pursuit of Beauty"	**Chris Mulherin** (28) "Balls, Strikes, and Truth in a Postmodern World: Holding On to Robust Truth Even When We Can't Be Certain"
11:15 AM	Parallel Session VI ends		
11:15 AM	ASA Registration Table closes		KOSC Loggia
11:30 AM	Exhibit and Book Room closes		KOSC Loggia
11:30 AM	Lunch		Lane Student Center

** You must be checked out of the residence halls by 10:00 AM*

Post-Meeting Activity

Monday, 30 July 2018		
12:30 PM 5:30 PM	Harvard Museum *	Meet at the circle drive by A J Memorial Chapel

** Please arrive 15 minutes before departure time.*

Plenary I — **Student Center Grand Ballroom**
Friday, 27 July 2018 — **7:30 PM**

Humanizing Therapeutics Discovery

Douglas A. Lauffenburger

The therapeutics discovery pipeline involves multiple stages for progress from idea to approved treatment, and has become extremely expensive over the past decades mainly due to the large proportion of potential drugs that fail in costly clinical trial stages. A chief reason for failure in clinical trials following promising findings in preclinical studies is that results in preclinical animal model studies do not generally translate strongly to similar results in human patients due to the incomplete correspondence of animal biology, physiology, and pathology in comparison to that in humans. Alongside this technical problem, a significant degree of societal concern about use of animal experimentation for human benefit exists.

The therapeutics discovery field has been attempting to address this challenge of "humanizing" the pipeline along a variety of avenues. These include efforts to construct human tissue and organ surrogates outside the body, using stem cell technologies and "organ-on-chip" platform technologies, and machine learning computational modeling approaches to bridge the preclinical-to-clinical divide either with human genomic data or with modeling of animal experiment data.

In this presentation, I will outline the various approaches to addressing this challenge and their current stage of prospect.

Douglas A. Lauffenburger *is Ford Professor of Bioengineering and (founding) Head of the Department of Biological Engineering at MIT.*

His major research interests are in cell engineering: the fusion of engineering with molecular cell biology, with central focus on systems biology approaches to complex pathophysiology in application to drug discovery and development. Lauffenburger has coauthored a monograph entitled Receptors: Models for Binding, Trafficking & Signaling *(Oxford University Press, 1993); he also coedited the book entitled* Systems Biomedicine: Concepts and Perspectives *(Elsevier, 2010). More than one hundred doctoral students and postdoctoral associates have undertaken research education under his supervision.*

Lauffenburger has served as a consultant or scientific advisory board member for numerous biotechnology and pharmaceutical companies, and his awards include the Galletti Award from AIMBE, the Coburn Award and Walker Award from AIChE, and the Distinguished Lecture Award and Shu Chien Career Achievement Award from BMES. He is a member of the National Academy of Engineering and the American Academy of Arts and Sciences, and has served as President of the Biomedical Engineering Society, Chair of the College of Fellows of American Institute for Medical and Biological Engineering, on the Advisory Council for NIGMS, and as a co-author of the 2009 NRC report on A New Biology for the 21st Century.

Plenary II — **Student Center Grand Ballroom**
Saturday, 28 July 2018 — **8:45 AM**

A Human Century?

Nigel M. de S. Cameron

The deepest question confronting us as we move further into an age framed by the powers of the digital revolution is whether they will enhance or depress our flourishing as human beings. How will the 21st century be remembered? As the time when human life became increasingly subordinated to machines—and their masters? Or as a time of supreme human flourishing, as smart machine aids lifted burdens from human shoulders, granting us a new level of freedom to be creative, to develop our relationships, to explore and love the natural world—and other natural worlds, and live *coram Deo* (in the presence of God).

Taproots of an answer lie in our innovative communities such as Silicon Valley; with governments as they decide whether vast corporations need traditional anti-trust treatment; with public intellectuals as they seek to frame understandings of immensely disruptive change. And with us, consumers, citizens—and believers.

The issues are immediate as well as long-term. How we respond now in matters such as smartphone use/social control, push-back to tech tycoons and their sprawling empires, limits to endless data-gathering (especially with IoT rollout and AVs), public and political engagement in the protocols that shape algorithms—how we handle these and related issues may determine far greater issues as Moore's Law and its successors ramp up the leverage that emerging technologies will afford us as the century progresses—whether as individuals, as governments, or as the owners of capital. The general disinterest shown by the church in every one of these matters to date does not give ground for encouragement.

Nigel M. de S. Cameron, *PhD, MBA is President Emeritus of the Center for Policy on Emerging Technologies in Washington, DC, which*

he founded in 2007, and Technology/Futures editor at UnHerd.com. In the 1990s he served as Distinguished Professor of Theology and Culture at Trinity Evangelical Divinity School, and was first Provost of Trinity International University. More recently he was a Research Professor and Associate Dean at Chicago-Kent College of Law in the Illinois Institute of Technology. In 2016 he was Fulbright Visiting Research Chair in Science and Society at the University of Ottawa, Canada.

His most recent books are Will Robots Take Your Job? A Plea for Consensus *(Polity/Wiley, 2017), and* The Robots are Coming: Us, Them, and God *(CARE Trust, London, 2017). Recent speaking engagements on the world in 100 years' time have included conferences hosted by* The Economist *magazine in Hong Kong and Spain, and the Champalimaud Foundation conference in Portugal.*

Cameron has represented the United States on delegations to the United Nations General Assembly and UNESCO, and been a participant in the US/EU dialogue Perspectives on the Future of Science and Technology. He recently ended his fourth term as a Commissioner of the US National Commission for UNESCO and Chair of its Committee on Social and Human Sciences.

Plenary III — **A. J. Gordon Memorial Chapel**
Saturday, 28 July 2018 — **7:30 PM**

The Joyful Complementarity of Science and Faith

Francis S. Collins

In this ASA presentation, I will start with a brief personal story about how I became a scientist and a Christian—coming to faith through a Lewis-like intellectual journey as a medical student. Over the last forty years, I have never found a conflict between what I have learned as a scientist and what I have learned as a Christian.

Then I'll introduce the main topic of the presentation—which might be subtitled "Fearfully and Wonderfully Re-made?". I'll present the latest scientific developments in the exploding field of gene editing. I'll emphasize how this new technology can be used to do wonderful things—like curing sickle cell disease in the next five years. But I'll also point out that the potential use of this technology, to edit the germ-line in human embryos (already done in China), brings us face to face with what it means to be human and with what it means to be made in the image of God. Are we prepared to cross that bridge? My answer will be no, at least not now—and maybe not ever.

Francis S. Collins, *MD, PhD is a physician-geneticist noted for his landmark discoveries of disease genes and his leadership of the international Human Genome Project, which culminated in April 2003 with the completion of a finished sequence of the human DNA instruction book. Since 2009 he has served as the Director of the National Institutes of Health, the largest supporter of biomedical research in the world, spanning the spectrum from basic to clinical research. He is an elected member of the Institute of Medicine and the National Academy of Sciences, was awarded the Presidential Medal of Freedom in November 2007, and received the National Medal of Science in 2009.*

Collins is the author of numerous books, including The Language of God: A Scientist Presents Evidence for Belief *(2006), in which he describes his own conversion from atheism to Christianity, and presents the case for an intellectually satisfying harmony between the worldviews of science and faith. He is also the founder of the BioLogos Foundation (www.biologos.org), which has emerged as a much-needed civil and winsome meeting place for serious discourse about how scriptural and scientific truths can inform each other.*

Plenary IV — **Student Center Grand Ballroom**
Sunday, 29 July 2018 — **8:45 AM**

Cybernetic Enhancement and the Problem of the Self

Noreen Herzfeld

What is the nature of the self? Are we unique? Does the self emerge in the narrative of our lives? Is our self individual or corporate? Or is there no such thing as a self? Answers range from the atomistic individualism of Protestantism, through the collective consciousness of Catholicism and Orthodoxy, to the "no self" of Buddhism. The self matters—its nature is central to sin and redemption, personal responsibility, relationship with God, and the afterlife.

Some computer scientists equate the self with the rational mind, which they posit will soon be partially or wholly digital, enhanced through chip implantation or by uploading to a computer. While the latter remains infeasible, chip implantation is already in the testing stage. Both promise tantalizing clues to the nature of the self. Their success or failure could give us new avenues through which to explore whether the self is individual, communal, or nonexistent.

Noreen Herzfeld *is the Nicholas and Bernice Reuter Professor of Science and Religion at St. John's University and the College of St. Benedict. She holds degrees in computer science and mathematics from Pennsylvania State University and a PhD in theology from the Graduate Theological Union, Berkeley.*

Herzfeld teaches courses in both the Department of Computer Science and the Department of Theology at St. John's University and the College of St. Benedict, reflecting her two primary research interests—the intersection of religion and technology, and religion and conflict.

Herzfeld is the author of In Our Image: Artificial Intelligence and the Human Spirit *(Fortress, 2002),* Technology and Religion: Remaining Human in a Co-Created World *(Templeton, 2009), and* The Limits of Perfection in Technology, Religion, and Science *(Pandora, 2010). She has also published numerous articles on such diverse topics as cyberspace as a venue for spiritual experience, embodiment as a sine qua non for personhood, the religious implications of computer games, and the prospects for reconciliation among Christians and Muslims in Bosnia.*

Plenary V | **Student Center Grand Ballroom**
Monday, 30 July 2018 | **8:45 AM**

The Question of Purpose in the Living World: Does Evolution "Lead to Love"?

Jeffrey P. Schloss

Although evolution has long been viewed as challenging particular historical beliefs important to a number of Christian traditions, more provocative claims—both by creationists and also by leading evolutionary thinkers—hold that it is fundamentally incompatible with any meaningful theism at all. Specifically, it's asserted that the Darwinian mechanism allows no theoretical room and the empirical record provides no evidential support for ascribing purpose to life's history or for the emergence of altruistic love as that purpose unfolds. The influential narrative goes beyond concluding that law-based explanations don't require a divine designer, to maintaining that Darwinian explanations utterly preclude it: science purportedly illuminates a world whose essential characteristics are irreconcilable with a wise Creator attaining his purposes in that world.

This talk will explore two fascinating areas of current work relevant to these issues. We'll survey emerging proposals of directionality, even "progress," across evolutionary trends in escalating biological function. And we'll examine proposals for a series of "major evolutionary transitions" in increasing scale of cooperative interdependence, culminating in what has been described as the "spectacular evolutionary anomaly" of human sociality. We'll conclude by considering recent proposals that religion is itself a crucial adaptation—a potent "biotechnology"—for transforming capacities and navigating challenges to caring unique to the human transition. Biological evolution underwrites the emergence of creatures whose flourishing is tied to caring for others, yet who need something beyond raw biotic endowment to get there.

Jeffrey P. Schloss *received his undergraduate education in biology from Wheaton College and his PhD in ecology/evolutionary biology from Washington University. He is currently Senior Scholar at the BioLogos Foundation and Distinguished Professor and T. B. Walker Chair of Biology at Westmont College, where he also directs the Center for Faith, Ethics and Life Sciences.*

He has taught at the University of Michigan, Wheaton College, the Creation Care Study Program, and has been a Danforth Fellow, a Crosson Fellow at the University of Notre Dame Center for Philosophy of Religion, a Plummer Fellow at St. Anne's College Oxford, a Witherspoon Fellow in Theology and Science at Princeton's Center of Theological Inquiry, and a Senior Fellow at Emory University Center for Law and Religion.

His scholarly interests include theoretical perspectives on the evolution of human cooperation, morality, and religious cognition—including the philosophical and theological entailments of these theories. Collaborative volumes include Altruism & Altruistic Love *(Oxford, with Stephen Post et al.),* Evolution and Ethics *(Eerdmans, with Philip Clayton),* The Believing Primate *(Oxford, with Michael Murray), and* Darwinian Perspectives on the Moral Sentiments *(Transaction, with Hillary Putnam et al.). Recent publications have appeared in* Behavioral and Brain Sciences; Religion, Brain, and Behavior; Theology & Science; PNAS; *and* Philosophy, Theology and the Sciences.

Worship Minister | **Student Center Grand Ballroom**
Sunday, 29 July 2018 | **9:30 AM**

Sunday Sermon

Sean McDonough

Sean McDonough *is a Professor of New Testament at Gordon-Conwell Theological Seminary. He came to Gordon-Conwell in 2000 from Pacific Theological College in Suva, Fiji, where he had served as the Chair of the Biblical Studies Department and as a lecturer in New Testament. McDonough remains active in ministry. He is a Sunday School teacher and occasional preacher at First Congregational Church in Hamilton. He is also a speaker for Medair, a Christian relief organization based in Switzerland.*

His research interests include creation/cosmology in the Bible and the Ancient Near East, Hellenistic Judaism, Greek philosophy and religion and the Book of Revelation. Publications include Cosmology and New Testament Theology *(coeditor: Jonathan Pennington, Continuum, 2008);* Christ as Creator: Origins of a New Testament Doctrine *(Oxford University Press, 2010);* Creation and New Creation: Understanding God's Creation Process *(Paternoster, 2015).*

McDonough's personal interests include supporting Boston's sports teams, spending time with his family, traveling, and hiking.

I.A: Modern Biotechnology I

KOSC 104

How Can Entropy Play a Major Role in Promoting Natural Selection?

Wayne K. Dawson
Chiba Institute of Technology,
University of Tokyo, Japan
University of Warsaw, Poland

In general, we often are taught that entropy is source of disorder and anything that can be done to reduce entropy will result in gaining more work from a system. In most problems of science and technology, structure comes largely from support from forces we control, and engines and power largely depend on minimizing waste heat.

For some time now, I have been researching the concept of entropy in the folding of biopolymers; particularly RNA, but additionally with proteins and more recently in the structure of chromatin in the cell. Within these studies, I have developed a quantitative model to estimate the entropic contribution to RNA, protein and chromatin structures, which I called the cross-linking entropy. The entropy involves integrating the contact contributions as a function of the local stiffness of the molecule.

Somewhat paradoxically, entropy appears to influence the maximum size of the structural domains in biopolymers and means most of the reported structures are essentially hovering around the minimum free energy. Even riboswitches (which can drastically alter their structure) tend to hop between two well-defined energy wells of similar free energy. Yet even more paradoxical is that structures are often quite stable to mutations, matching biology. Hence, the model also provides a clear physical mechanism that supports Kimura's neutral mutation concept in molecular evolution.

As a Christian, I have also had to struggle with how to understand the findings of science with the biblical narrative. Therefore, in the latter part of my talk, I will briefly explain why I chose to follow Jesus in the real world.

I.B: Digital Technology I

KOSC 107

Electronic Waste (E-waste)

Terry M. Gray
Colorado State University

What happens to your old phone or laptop when you get a new one? After a possible life on the second-hand market or a market for used components, electronics reach an end-of-life. Globally, 40–50 million metric tonnes of e-waste are generated each year.

E-waste contains toxic substances such as lead, mercury, arsenic, cadmium, phthalates, brominated flame retardants, dioxin producing PVC, etc. E-waste must be disposed of separately from the normal solid waste stream in order to prevent these toxins from causing environmental damage and adverse health effects.

E-waste also contains valuable resources such as gold, silver, and other elements that are economically worth recovering. Some recycling has been accomplished, but until recently this has been via majority world e-waste dumps where cheap labor and unsafe working conditions enable the recovery of the most useful of these materials. Global treaties have been put in place to eliminate some of these seemingly unjust practices.

E-waste activist groups have brought this problem to the world's attention. Other social issues such as conflict minerals, social license to operate (SLO), and not in my backyard (NIMBY) are related to e-waste. Mining and processing of mineral resources should also be included in the life-cycle analysis.

Christian perspectives on e-waste include thoughts on consumerism, the pros and cons of personal computer and mobile phone technology, stewardship of natural resources, and global justice with respect to recycling and dumping of industrial waste.

I.C: Evolution Pedagogy

Jenks 237

Teaching Evolution to Young-Earth Trained High School Sunday School Students

Mark A. Strand
North Dakota State University

Scientifically informed positions on scripture play an important part of the intellectual and spiritual formation of Christian young people. The creationism movement, particularly Answers in Genesis (AIG), has used books, videos, and conferences to establish themselves as the most influential source of information for evangelical Christians wanting to understand origins. Therefore, young earth creationism has shaped the thinking of young people and curricular decisions of many Christian schools and home schoolers.

In 2015, funded by the Templeton Foundation, Trinity International University began The Creation Project, to catalyze a field of study around the doctrine of creation that is faithful to scripture and informed by scientific evidence. This became the inspiration for the project presented here, which was to design a 6-lesson course to introduce evolution to high school students in a Sunday School class in a Midwestern evangelical church. A 19-item survey was created and administered pre- and post-course.

This session will introduce the process of helping a historically young-earth creationist evangelical church begin to revisit their convictions on the issues and practices surrounding origins. It will report on the process of working with the pastors and of designing the course. The results of the pre/post survey will be reported.

This session will introduce best practices to helping conservative, young-earth creationist churches open up to a more expansive view of scripture, and the ways in which the findings of modern science inform biblical exegesis and the conclusions of such.

I.D: Student/Early Career, Track 1

Sponsored by ASA and InterVarsity's Emerging Scholars Network (ESN)

Jenks 226

Now What? Choosing Next Career Steps

Coordinated by
Thomas Grosh IV[1] and
Hannah Eagleson[2]
[1]ESN Associate Director
[2]ESN Writer/Editor

Panelists:

- **Bob Kaita**
- **Otonye Braide-Moncoeur**
- **Andy Walsh**

Are you an undergraduate trying to figure out your next steps? Confused about whether grad school, industry, or education is a better fit for you? Our panel of experts will talk about how to know which is best for you, and how to prepare now for success in whichever field you choose.

The student track morning sessions are designed to be especially helpful for undergraduate students, and the afternoon sessions are designed to be especially helpful to graduate students and other early career science professionals. However, all are welcome to both sessions.

I.A: Modern Biotechnology I (cont'd)

KOSC 104

CRISPR Ethics: New Challenges, or Nothing New under the Sun?

Robin Pals Rylaarsdam
Benedictine University

CRISPR/Cas9 genome editing technologies are revolutionizing biology research with their delivery of inexpensive and accurate changes to specific sites in a cell's genome. While this technology is becoming a workhorse at the laboratory bench, its ease of use and new levels of specificity have raised the real prospect of germline human modifications—altering human embryos to change not only that individual, but also all of their future descendants.

Some human embryos have been modified, although no reports of pregnancies that carry CRISPR/Cas9-modified embryos have been reported. Serious work is being done on the ethics of this germline modification, with a variety of conclusions resulting from the research. It is reasonable to ask whether this is a new ethical issue or simply a revisiting of past questions with a more urgent need for a response, given the power of the CRISPR/Cas9 technology.

In this presentation, it will be argued that CRISPR/Cas9 will have an immense impact for the good on biomedical research, particularly in producing better models for human disease and applying the technology to *ex vivo* gene therapy. The major ethical problems surrounding germline gene editing are common to ethical topics that have been considered for many years, especially preimplantation genetic diagnosis (PGD).

Significant attention should be focused on the expanded use of CRISPR/Cas9 in situations that impact ecosystems—agriculture and the release of genetically engineered organisms to remediate environmental damage or to prevent human diseases.

I.B: Digital Technology I (cont'd)

KOSC 107

A Christian Response to the Good, Bad, and Improbable Predictions of Artificial Intelligence Futurists

Timothy P. Wallace

John McCarthy, Marvin Minsky, and others started the field of Artificial Intelligence (AI) in 1956 and introduced it at a conference at Dartmouth. They released some extremely over-optimistic predictions about its future development after writing some rather simple computer programs.

The AI prediction field has been a growth industry since then, with some people predicting a ''Singularity'' in which computers attain near-divinity and enable people to live forever by copying their brains into new hardware. Alternatively, some predict that computers will greatly exceed our capabilities, be granted human status, and, in the worst case scenario, eventually dispose of us.

Many so-called experts disagree substantially on the future of AI; more mundane predictions involve greatly increased automation, including fully autonomous vehicles and military machines.

There are many religious and ethical issues which arise in contemplating this large set of future predictions. Rather than addressing them all, this talk will first provide guidance on which predictions seem reasonable and which should be discounted or moved to the far future of 50 years or more out, based on my 40 years of experience building actual systems. The observed pattern is that the wildest predictions come from philosophers, physicists, visionary CEOs, and others who have not personally designed state-of-the-art machine intelligence systems.

Finally, some ethical and religious issues will be raised for the more plausible AI scenarios.

I.C: Evolution Pedagogy (cont'd)

Jenks 237

BioLogos INTEGRATE: New Christian Worldview Supplement for High School Biology

Kathryn Applegate
BioLogos

Many Christian high school biology teachers want to give their students a rigorous, thorough understanding of biology—including areas such as evolution, ecology, and bioethics—and at the same time help them deepen their Christian faith. Unfortunately, they too often fall short of attaining this goal.

Studies in biology education have documented the poor quality of science instruction in faith-based schools, and about 1 in 4 young people who leave the church do so because they feel "Christianity is anti-science."

Currently, Christian school biology teachers and homeschool parents must choose between Christian-published curricula, which are generally written from a young earth creationist or intelligent design perspective, and secular curricula, which offer no Christian worldview guidance.

To address this dilemma, BioLogos is developing an online Christian worldview supplement, presenting a positive science-faith paradigm for Christian students, to be used alongside secular curricula for high school biology. I will summarize some recent science education research supporting this approach and offer a sneak peek at the resources in development.

I.D: Student/Early Career, Track 1 (cont'd)

Jenks 226

Don't Leave Undergrad without It: Wisdom for Thriving in Science

Coordinated by
Thomas Grosh IV[1] and
Hannah Eagleson[2]
[1]ESN Associate Director
[2]ESN Writer/Editor

Panelists:

- **Daisy Savarirajan**
- **Denis Lamoureux**

What if you could get the distilled experience of years in a field, right now? Get a head start on a great career in science as our panel shares their top tips for thriving in a science career and growing as a scientist.

The student track morning sessions are designed to be especially helpful for undergraduate students, and the afternoon sessions are designed to be especially helpful to graduate students and other early career science professionals. However, all are welcome to both sessions.

I.A: Modern Biotechnology I (cont'd)

KOSC 104

Developments in Optogenetic Neuromodulation and Their Ethical Implications

Daniel B. Dorman
Neuroscience PhD Candidate,
George Mason University

Optogenetics is a technology that enables precise, cell-type specific modulation of neuronal activity. Light sensitive proteins are inserted into neurons and allow for optical activation or deactivation of specific neurons, achieving much finer control of neural activity than other existing neuromodulation techniques.

Optogenetics has been employed extensively in animal studies to alter animal behaviors. For instance, by optogenetically silencing neurons that had previously been recruited in drug-seeking behavior, scientists were able to abolish drug-seeking. Several studies have shown that optogenetics can be used to evoke memory recall, induce false memories, or erase memories in lab animals.

Optogenetics currently exhibits limitations and is far from feasible for clinical use in the human brain. However, clinical trials have recently begun using optogenetics to restore some light sensitivity in the eyes of patients with blindness due to retinal disease, and other clinical uses in the peripheral nervous system may not be far off.

As precise neuromodulation continues to develop with the potential for future clinical impact, it raises important ethical questions. Such a technology could provide more effective treatment for mental illness and neurological disease, but could also confer unprecedented control of cognition, memory, and behavior. Would it ever be ethically justifiable to erase certain memories? As Christians, it is particularly important to address these ethical questions which touch at the heart of the human person and what it means to bear the image of God.

I.B: Digital Technology I (cont'd)

KOSC 107

A Technoethical Approach to Original Sin: Will Robots Sin?

Timothy Opperman

By utilizing a nonconcordist hermeneutical method, original sin can be understood as an evolutionary process set within the context of the development of human consciousness, conscience, and morality. I argue that humanity's innate creaturely selfishness becomes sinfulness in the light of an emergent moral cognition paired with relational interaction with divinity. Essentially, humans learn what is right and wrong prior to learning what is right and wrong in the eyes of God.

I will summarize an evolutionary creationist nonconcordist hermeneutical interpretation of original sin and explain how the emergence of human sinfulness may be analogous to machine morality.

If moral agency and responsibility are emergent evolutionary properties for humans, then will artificial intelligence (AI) develop a similar morality? Will AI have an innate selfishness-turned-sinfulness? Will fallen humans create fallen programs? Will AI willfully choose to commit sinful acts?

I.C: Evolution Pedagogy (cont'd)

Jenks 237

Using a "Reacting to the Past" Game to Teach Faith and Science in an Origins Class

Tony Jelsma
Dordt College

"Reacting to the Past" games are role-playing games designed to help students wrestle with big ideas in history. In my upper level Perspectives on Origins class, I use one of these games to address theological, philosophical, and scientific issues associated with the creation-evolution debate.

For part of this course, students play the game, Charles Darwin, the Copley Medal, and the Rise of Naturalism, 1861–1864. In this game, participants determine whether Darwin should receive the prestigious Copley medal. Students take on roles as members of the Royal Society: some are for Darwin; others, against; and still others, indeterminate. Students debate, give speeches, and write papers that are consistent with their role.

Along the way, they learn about the scientific controversies that were prevalent in the mid-18th century. These include inductive vs. deductive reasoning, the role of theistic explanations in science, natural theology, and the role of science in society.

The game is student-run, with part of the motivation coming from bonus points earned by winners of the debate. The professor's role is to work in the background and to provide feedback on student papers and presentations. After initial uncertainty, students buy into the concept with enthusiasm, making this one of the more memorable courses in their college curriculum.

I.D: Student/Early Career, Track 1 (cont'd)

Jenks 226

Speed Mentoring for Undergraduates

Coordinated by
Thomas Grosh IV[1] and
Hannah Eagleson[2]
[1]ESN Associate Director
[2]ESN Writer/Editor

Wondering how to put your career in science and your mission as a believer in Christ together? Curious how to flourish as a scientist? Want to process one of our tracks or a plenary session further? Not sure how to find mentors? Join us for speed mentoring!

Our ESN track speakers and others will be available to share advice and answer your questions in a small group setting. This interactive session will allow you to meet mentors and peers and learn from them. Emphasis will be on undergraduate settings, but interested grad students and other early career members are also welcome.

Join us after the session for the student/early career lunch.

The student track morning sessions are designed to be especially helpful for undergraduate students, and the afternoon sessions are designed to be especially helpful to graduate students and other early career science professionals. However, all are welcome to both sessions.

II.A: Modern Biotechnology II

KOSC 104

Biotechnology and the Cost of Medicine: A Crisis in Pharmaceutical Innovation?

Vincent Ling
Takeda Pharmaceuticals

The translation of modern biotechnologies into applied medical therapies holds great allure for forward-thinkers and entrepreneurs in the medical industry.

Recent clinical advances, including CAR-T cells, immune checkpoint inhibitors and gene therapies, have become costly new medicines with prices approaching $1M per patient.

As even more exotic technologies are being considered for future therapies, potentially insurmountable economic burden will pit superior medical efficacy against practical economics.

This presentation will provide an overview of current challenges that exist in biotechnology innovation, and will offer a personal reflection on the skills and ethics required to navigate this competitive ecosystem.

II.B: Engineering and Appropriate Technology I

KOSC 107

Teaching Sustainable Engineering Topics in a Required Materials Engineering Class

William Jordan
Baylor University

Sustainable engineering is an important topic that has only recently been incorporated into many engineering programs. One approach to teaching this has been to cover the topics in an engineering ethics course or in a stand-alone sustainable engineering technical elective. This presentation describes what the author has done in a required junior-level materials engineering course.

Sustainable engineering is first presented from a Christian perspective in an introductory lecture. There is then another module that describes sustainable materials engineering in more detail.

Students then do two separate small group research projects in this area. The first project examines baseball bats made from wood, aluminum, and composite materials. Students investigate this from both a performance perspective as well as from a sustainable perspective. They then prepare short oral presentations on their recommendations. They need to do this analysis for a specific market (such as Major League Baseball, college baseball, etc.).

The second module is about corrosion. After an introduction to eight forms of corrosion, student teams go out into the community and photograph something that has been corroded. On one PowerPoint slide they need to show the photo, explain what type of corrosion it is, and then how this corrosion could have been avoided. This last portion deals with the sustainability of the product.

Assessments of these projects have been very positive and will be reported in the presentation.

II.C: Faith and Science Education I

Jenks 237

Chemistry and Society: Integration of Faith and Science in General Education

Kristen Mudrack
Milligan College

Nonscience major students who are required to take a lab science at Milligan College often describe science as “scary, hard, and too much math.” In designing a chemistry general education class for these students, one must first help them overcome their fear of chemistry. Only then can you open the door to helping them see the chemistry that is all around them—in their dorm rooms, the dining hall, and beyond.

Of particular importance in Christian higher education is the integration of faith into these concepts. Through class discussions and readings, students are able to interact with scientific concepts such as global warming, sustainable agriculture, and genetic engineering in the context of their life and faith.

By making the scientific concepts attainable to these students, they not only overcome their fear of science, chemistry in particular, but also learn to grapple with difficult social and ethical issues in the context of faith.

II.D: Student/Early Career, Track 2

Sponsored by ASA and InterVarsity’s Emerging Scholars Network (ESN)

Jenks 226

Generating Great Ideas in Academia and Science Careers

Coordinated by
Thomas Grosh IV[1] and
Hannah Eagleson[2]
[1]ESN Associate Director
[2]ESN Writer/Editor

Panelists:

- **José Gómez-Márquez**
- **Leslie Wickman**
- **Alan Dickin**
- **Bob Kaita**

How can you jumpstart your ability to innovate and grow creatively in a science career? Join our panel of scientists in academia, industry, and education to hear what helps with finding and implementing great ideas in different settings.

The student track morning sessions are designed to be especially helpful for undergraduate students, and the afternoon sessions are designed to be especially helpful to graduate students and other early career science professionals. However, all are welcome to both sessions.

II.A: Modern Biotechnology II (cont'd)

KOSC 104

Should Caregivers Risk Their Lives for Their Patients? The SARS Epidemic in Toronto as a Test Case

James C. Peterson
Roanoke College; Virginia Tech Carilion School of Medicine

In November of 2002, recognized cases of a new disease began in China. Carlo Urbani, an infectious disease expert for WHO, was the first to gather samples and within two weeks was dead. Initial signs were a fever over 100° and labored breathing.

The first patient in Toronto was diagnosed initially at Scarborough Grace Hospital (SGH) as having severe pneumonia. Twenty-eight staff members of SGH were infected with a fatality rate of about 11%. Etiology and transmission were unknown.

Do you show up for your shift at SGH?

This presentation will focus first on the ethics of this opening question, and next on what became the second main question: if there are not enough mechanical ventilators to sustain those who need them to survive, who should have life-saving access when not all can?

The ethics we discuss will of course apply beyond SARS to the wide range of pandemics that appear all too often. We do not know which particular pandemic will strike in the next few years, but we have good reason to expect from experience that some kind of pandemic will.

II.B: Engineering and Appropriate Technology I (cont'd)

KOSC 107

Communicating the Bible to All the World

Richard E. Denton, Tod J. Allman, Stephen A. Beale
Dartmouth College

There are 114 million people who do not have access to any scriptures in their native language, and another 1.5 billion people who do not have access to the entire Bible in their native language. Translation is still lacking for thousands of minority languages.

All the Word Bible Translators, Inc is developing technology to eradicate Bible poverty around the globe. Specifically we our developing a software system which is capable of translating the entire Bible, commentaries, devotional materials, and Christian classics much faster than manual translation.

We use a computer-internal representation of meaning, and a rules-based system for generation that results in an accurate translation, often needing additional editing only to improve naturalness of language.

Our illustrated texts are shared through free cell phone apps. In the Philippines, for instance, 32% of the people have a smart phone, making widespread distribution feasible.

Here we concentrate on how we use a simple computer-internal representation of the text to communicate complex concepts. Rules for complex concepts can insert more advanced vocabulary if it is appropriate for a particular language.

II.C: Faith and Science Education I (cont'd)

Jenks 237

High School Curriculum: *The Crossroads of Science and Faith: Astronomy through a Christian Worldview*—Outreach Phase

Gladys Kober, Susan Benecchi, Paula Gossard, Ashley Zauderer

Statistics clearly show that many Christians lose their faith during their college years, and that confusion about science and faith plays an important role in this outcome. In 2010 a vision to make a difference in changing these statistics was born, and we started our long journey to develop a textbook to teach astronomy and equip Christian students to defend their faith with sound reasoning in a secular university environment.

This one-year curriculum consists of two parts: (1) an introduction to the science and faith dialogue and (2) astronomy as a discipline, including many interviews with professional Christian astronomers to engage and inspire students (more information at www.GlimpseofHisSplendor.com).

More than 30 Christian professional astronomers contributed with chapter revisions and interviews. The first print was completed in March 2015, three other prints have been made and about 100 electronic copies have been sold online.

As self-publishers we are marketing on our own with limited financial resources, so the current challenge is to reach out to the Christian schools and homeschool communities. Currently five Christian schools and one online Christian homeschool academy have adopted our material in this school year. We've found our material most effective at the junior- and senior-high level.

In this presentation, we will share the many avenues we have used for marketing, some results we have obtained from our outreach efforts, and our future plans.

II.D: Student/Early Career, Track 2 (cont'd)

Jenks 226

Networking for the Common Good

Coordinated by
Thomas Grosh IV[1] and
Hannah Eagleson[2]
[1]ESN Associate Director
[2]ESN Writer/Editor

Moderator:

- **Kevin Ford**

Panelists:

- **Timothy Opperman**
- **Dorothy Boorse**
- **Bob Kaita**

Everyone tells you that you have to network to do well in a science career, but the idea remains intimidating for many early career scientists. It can seem awkward at best and self-serving at worst. But networking can actually be altruistic, creative, and maybe even fun. Hear from a panel of experienced professionals on how to make networking better for everyone.

The student track morning sessions are designed to be especially helpful for undergraduate students, and the afternoon sessions are designed to be especially helpful to graduate students and other early career science professionals. However, all are welcome to both sessions.

II.A: Modern Biotechnology II (cont'd)

KOSC 104

The Coming Age of Human Life Extension: Exploration of Attitudes on Life-Extending Interventions in Separate Samples of Younger and Older Adults

Loren A. Martin
Azusa Pacific University

As biotechnological advances continue to increase the likelihood of living a longer life, public attitudes toward life-extending interventions must be further explored. We surveyed nearly 500 individuals through two distinct yet related studies in an effort to examine factors that contribute to acceptance or rejection of human life extension.

In the first study, 197 undergraduate and graduate students completed an online questionnaire that included several well-established instruments that assessed religious beliefs, religious motivations, death attitudes, and quality of life, as well as vignettes designed to explore desirability for personal use or research of life extending interventions. For the second study, 279 individuals, 65–95 years of age, completed a similar questionnaire containing many of the same instruments and identical vignettes in order to enable comparisons to the much younger population of the first study.

Both studies demonstrated significant positive correlations between negative death attitudes and life extension desirability, and significant inverse correlations between both positive afterlife beliefs and intrinsic religiosity and support for life extension.

Surprisingly, higher quality of life did not influence life extension desirability in the younger population but it was related to more support for life extension in the older population. Irrespective of demographic and other factors, weak life extension (defined as increased life expectancy to 100 years) garnered the most support, followed by strong life extension (defined as increased life expectancy to 150 years), and then indefinite life extension.

II.B: Engineering and Appropriate Technology I (cont'd)

KOSC 107

An Overview of Radiation Therapy

Kirk Bertsche
Accuray, Inc.

In our lifetimes, 40% of us will be diagnosed with cancer. Over 1.7 million new cancer cases appear in the US annually. More than half of all cancer patients will receive radiation therapy as part of their treatment.

Radiation therapy today generally uses high-energy X-rays produced by an electron linear accelerator. But a variety of alternative radiation types (neutrons, protons, ions) and radiation sources (synchrotrons, cyclotrons, radioisotopes) are used as well.

We will present an overview of radiation therapy's interesting history, physics, and technology. We will survey the breadth of radiation types and sources which are used today, with emphasis on electron linear accelerators for X-ray production. We will also discuss recent developments in radiation therapy and proposals for new radiation therapy devices.

II.C: Faith and Science Education I (cont'd)

Jenks 237

The Heavens Declare the Glory of God: Sidewalk Astronomy Evangelism

Ed LaBelle
Founder of
Psalm 19 Astronomy Society

God reveals his attributes in many ways (Rom. 1:19–20), and today amateur astronomy can be one way for apologists to reach the public to discuss the Creator of heaven and Earth.

A sidewalk astronomy ministry was formed in 2016 called Psalm 19 Astronomy. The ministry's mission is "sharing the beauty and majesty of God's universe through astronomy." As part of our mission, we discuss dual revelation, or God's Two Books, with our guests. We seek to show that there can be harmony between God's World—the universe, and God's Word—the Bible. We believe God is the author of both so they will always be in agreement when properly interpreted.

We have developed a series of astronomy cards that we hand out to passersby who stop to look into our telescopes to educate them on the science of astronomy. For example, our planets card has an image of the planets that orbit our Sun in order from Mercury to Pluto (and yes, we still consider Pluto a planet!) The backside includes information about each planet: distance from the Sun, planet diameter, and how many moons each planet has.

To date over 3,000 passersby in downtown Austin, Texas, have looked into our telescope at the beauty of God's creation. There are four other locations in the US where Psalm 19 Astronomy events have been held.

In this presentation, I will explain how sidewalk astronomy can be used as an evangelical and apologetics ministry to reach out to people from all backgrounds, nations, and religions and to demonstrate that the God of the Bible is also the Creator of the universe.

II.D: Student/Early Career, Track 2 (cont'd)

Jenks 226

Speed Mentoring for Graduate Students and Early Career Professionals

Coordinated by
Thomas Grosh IV[1] and
Hannah Eagleson[2]
[1]ESN Associate Director
[2]ESN Writer/Editor

Wondering how to put your career in science and your mission as a believer in Christ together? Curious how to flourish as a scientist? Want to process one of our tracks or a plenary session further? Not sure how to find mentors? Join us for speed mentoring!

Our ESN track speakers and others will be available to share advice and answer your questions in a small group setting. Emphasis in this session will be on graduate school and early career professional settings, but interested undergraduates are welcome too.

The student track morning sessions are designed to be especially helpful for undergraduate students, and the afternoon sessions are designed to be especially helpful to graduate students and other early career science professionals. However, all are welcome to both sessions.

III.A: The Big Picture

KOSC 104

Beyond the Free Will Defense: Natural Evil, Theodicy, and Sacrificial Love

Loren Haarsma
Calvin College

Atheists sometimes point to features of the natural world as arguments against theism (e.g., age and immensity of the universe, hiddenness of divine action, randomness, suffering caused by natural events and moral evil, evolution, the neuroscience of belief).

In response, numerous Christians have developed "free will" or "soul-making" accounts. A recent book by Christian Barrigar (*Freedom All the Way Up*, Friesen Press) affirms these accounts but advocates a shift of emphasis, arguing for free will as only a necessary precondition for God's ultimate purpose of creating beings capable of understanding and living in relationships of self-sacrificial love toward each other and God.

Self-sacrificial love is especially central to God's Trinitarian nature and revealed in Christ's redeeming work. This *agape* account for these features of the world can be appealing to many Christians and powerfully inviting for non-Christians. It also has some implications regarding the subtlety of divine action in the natural world, and the (perhaps) inevitability of human sin, which some Christians might find theologically troubling, and are worth further discussion.

III.B: Digital Technology II

KOSC 107

Interacting with the Bible Using Artificial Intelligence and Virtual Reality

Isac Artzi
Grand Canyon University

We routinely read the Bible, and we research, discuss, and analyze it. For the most part, the visual imagery is provided by modern movies, TV shows, or Renaissance artistic interpretations. Current advances in virtual reality and artificial intelligence offer an opportunity to create immersive environments, which can provide a new way to experience biblical events.

Text analysis algorithms can be used to create avatars, which represent biblical characters. Using mixed reality technology, students not only can view these characters, but also can interact with them and engage them in a conversation. This presentation discusses our nascent research, focusing on two tracks: (1) use of biblical narrative to recreate virtual places and events; (2) use of machine learning to construct characters that talk and act like the ones described in the Bible.

Given that biblical literature is written and translated in multiple languages, we envision the creation of an interactive experience in several languages, in order to convey a better sense of biblical sounds and expressions. For example, the immersed user could choose to listen to Moses speaking in Hebrew or Jesus answering questions in Aramaic.

This presentation highlights the integration of faith-based education, as a mechanism to enhance the learning environment in science (in this case, computer science). This initiative is innovative on multiple fronts: (a) it engages undergraduate students in advanced cross-disciplinary research; (b) it offers an opportunity for harmonious collaboration among science, faith, and history; and (c) it enables interaction with the text and characters in their biblical context.

III.C: Biology and the Problem of Evil

Jenks 237

Were Parasites Mutualistic at the Beginning?

Oscar Gonzalez
Emmanuel College

Two of the objections to believing in an all-loving God are suffering and disease. Parasites are responsible for several ailments in humans and the rest of creation. Christians that endorse young-earth creationism explain that all parasites and predators were good (mutualistic) at the beginning, before the Fall of Adam.

The assumption that negative interactions in nature were once positive will be used as a hypothesis and tested with current ecological and evolutionary studies.

I will explain different sorts of parasites that exist in nature and make an argument that they provide challenges that push our bodies and the ecosystems to improve. Sometimes good outcomes may result from the action of parasites in the natural world.

Viruses, bacteria, fungi, plants, and animals that are parasites are very important in the economy of creation. We can make harmful parasites helpful to us by managing them through technology.

I will present a case in which a negative interaction between birds and plants benefits an endemic species and maintains the ecological interactions of a forest in the Andean mountains.

Parasites are harmful, but looking at the big picture, they can help the ecosystem, the human body, and the human spirit by humbling us and making us dependent on God. There is no need for the Christian to subscribe to an unproven and highly improbable doctrine that parasites were once mutualistic to understand the goodness of God in creation.

III.D: Local Chapters Seminar

Jenks 226

Overview of Local Chapters Program

Coordinated by
Leslie Wickman and **Vicki Best**

This session will include a description of the ASA Local Chapters Campaign, including an overview and status of each of our existing local chapters. We will also briefly go through the Local Chapters Handbook.

III.A: The Big Picture (cont'd)

KOSC 104

The Need for Generation Z Christian Apologetics

James D. Sideras
University of Hertfordshire

Christian apologetics stands at a critical juncture. Since the turn of the millennium, increasing numbers of people have been rejecting the Christian faith. Numerous research studies consistently show that Christian populations in both the US and Europe are declining, while the number of adults with no religious affiliation is rapidly growing.

This trend is alarmingly high among millennials and young adults, who typically eschew Christianity during adolescence. So what is driving this change in the Western religious landscape? Research findings vary but according to a recent survey, most 13- to 18-year-olds (generation Z) reject Christianity because of a perceived divide between science and religion.

This particular finding brings into question the efficacy of Christian apologetics among generation Z-ers. While research in this area is scarce, common apologetic approaches involving long scholarly treatments of subject matter, lengthy public debates and winning arguments, appear far removed from piquing the interests of generation Z-ers.

This detachment stems from a failure to understand their cultural differences with older adult generations. These differences include increased technological engagement, social media dependency, demand for immediacy, importance of self-image, and acute aspirations. In other words, in the fast-paced and visual world of generation Z, a more novel, meaningful, and immediately accessible form of Christian apologetics is required to win them over.

III.B: Digital Technology II (cont'd)

KOSC 107

Helping the 33%: Automation-Displaced Workers

Paul H. Carr
AF Research Laboratory, Emeritus

Up to one-third of the American work force will have to switch to new occupations by 2030, according to the McKinsey Global Institute's recent automation report.

After the beginning of the Industrial Revolution in England, coal miners, who had left their farms, rioted in response to their oppressive poverty. John Wesley preached successfully to thousands of these miners in open fields and founded societies and schools, giving birth to Methodism.

Education is essential for helping automation-displaced workers to be qualified for new jobs. Since 1964, the wages of those with education beyond a Bachelor's Degree have doubled, while high school dropouts are earning less. Religious communities have established universities. Methodists founded Boston University to educate their ministers. Similarly, Congregationalists founded Harvard in 1636. A recent example is Gregory Boyle, SJ's founding Homeboy Industries.

In this presentation, I will discuss options for funding a minimum income for those who would meet a means test, or a basic income for all citizens. Funds could come from eliminating all other welfare services.

Another option could be a fee on fossil fuels whose emissions are warming our climate. This would stimulate the development of green energy technology. A family of four could receive an income of $2,000.00 per year from the carbon fee.

III.C: Biology and the Problem of Evil (cont'd)

Jenk 237 s

Wholeness and Ecosystems: The Functionality of Fear

John R. Wood and
Darcy Visscher
The King's University

Fear is a fundamental human emotion, a core theological category and an important ecological driver. But how can fear, disturbance, and death function positively?

Theologically fear seems more often a negative category to be transformed by love. But recently the formational role of predatory threat has been noticed by ecologists.

Developments in diverse fields, from the neurosciences to the application of behavior in ecological theory, are raising new interpretative opportunities. These discoveries challenge the traditional understandings of death and fear.

A renewed theology of creation, with a duty to care is also bringing the ideas of fear and mortality to the forefront of the conversation. On these views fear has a positive role, one that shapes not only individual behavior, but also has consequences for trophic interactions and the social relationships that continuously shape ecosystems.

One might ask, what can ecology teach us about the fear of the Lord? Fear is essential, not just for individual survival, and not merely for humans, but for inducing wholeness and well-being across the entire biosphere. The possibility of death and the fear engendered by predators seems to be an essential aspect of the creational order.

A rich body of theological thinking on fear (and death) from Saints Augustine and Francis to Karl Barth and Paul Santmire can help us in developing a robust creation care theology that accounts for the functionality of fear.

III.D: Local Chapters Seminar (cont'd)

Jenks 226

Chapter Leaders

Coordinated by
Leslie Wickman and **Vicki Best**

Leaders of Local Chapters from across the US and Canada will share highlights, best practices, and lessons learned from their experiences. There will also be time allocated for Q&A with the audience.

III.A: The Big Picture (cont'd)

KOSC 104

Being a Scientist and a Christian: Lessons from Religious Dual Belonging

David Larrabee
East Stroudsburg University

ASA members share a dual commitment to Christianity and the scientific enterprise. The result is both an external and internal dialogue between science and Christianity. Many authors have discussed the relationship between science and religion. This talk addresses the internal dialogue between science and Christianity for those of us who share a commitment to both.

There are individuals who have a commitment to two differing religions, a dual belonging. I am not referring to inculturation, syncretism, or the rejection of all truth claims. Rather, the acceptance of the "totality of religious practices and beliefs" of two different religions resulting in "the encounter with conflicting or incompatible claims to absolute truth."

One difference between dual religious belonging and a commitment to science and Christianity is that science holds all truth to be provisional until new experimental evidence results in an improved theoretical understanding. With this caveat, there are lessons to be learned.

This presentation draws on the experience of both those with dual religious belonging and those committed to inter-religious dialogue to understand the nature of our internal dialogue and ways of conducting that dialogue. Catherine Cornille's five attitudes to interreligious dialogue (humility, commitment, interconnection, empathy, and hospitality) and several suggestions for exploring the tensions in the science and religion dialogue will be explored.

III.B: Digital Technology II (cont'd)

KOSC 107

Christianity, Transhumanism, and Techno-Syncretism

David C. Winyard Sr.
Mount Vernon Nazarene University

Christianity, as the Apostles' and Nicene Creeds define it, holds to essential doctrines of God and the natural order. Among these doctrines are the Trinity: God as Father, Son, and Holy Spirit; *ex nihilo* creation; the *imago Dei*; sin and its effects; the incarnation; salvation through Jesus Christ; the resurrection of the body; divine judgment; and finally, eternal life. Notwithstanding differences in how these biblical doctrines are understood, Christians live in relationship with God, with Jesus Christ pre-eminent.

In contrast, secular transhumanism aspires to eternal life without reference to Christian thought. Rationalism and materialism are its presuppositions. The origins and history of human life are irrelevant compared with its destiny. Science and technology are transhumanism's means of salvation. The goal is complete freedom from natural limitations, including morphological freedom: the ability to shape our bodies at will, or to eliminate them completely through some form of virtual existence.

Some Christians have sought to integrate their faith with transhumanism. To do this, fundamental Christian doctrines are minimized or denied, the gospel of Jesus Christ among them. Christians can and should uphold traditional biblical Christianity, the Apostles' and Nicene creeds, and the value of special and natural revelation without elevating science and technology to the status of idols.

III.C: Biology and the Problem of Evil (cont'd)

Jenks 237

Biological Control of Weeds: Reconstituting God's Plan

F. Allen Dray Jr.
USDA, ARS Invasive Plant Research Lab

Cain was sent away, Noah floated away, Abraham was called away, and Moses walked away. For as long as we can remember, we humans have been migrating. Along with our families, we took the livestock, crops, and medicinal plants with which we were familiar. The pace at which we've migrated has accelerated during the past half-millennium, as has our movement, intentional and otherwise, of organisms associated with us. The result has been a global redistribution of species which Gordan Orians labeled the Homogocene (the post-Columbian portion of the Holocene Epoch).

Most plants that we've intentionally relocated have stayed where we put them. Although they alter the landscapes into which we've introduced them, these changes are largely planned and predictable. Unfortunately, a subset of such plants escape our care—invading nearby habitats and causing unintended disruptions in the ecological functioning of affected ecosystems. By the time the problems are recognized, it is seldom possible to "put the genie back in the bottle" through eradication of the troublesome plant (i.e., weed). Instead, we are left seeking methods whereby we can limit harmful effects of these invasive species.

Biological control of weeds is a discipline that seeks to reassociate such plants with their herbivores, i.e., to reconstitute God's original plan for these organisms. Effective programs reduce ecological advantages that invaders have over native species, thereby mitigating deleterious aspects of these weeds.

This talk presents a primer of biocontrol: its background, its controversies, and its successes.

III.D: Local Chapters Seminar (cont'd)

Jenks 226

Planning Workshop

Coordinated by
Leslie Wickman and **Vicki Best**

This will be a hands-on working session to get new Local Chapters started. ASA leaders will help members fill out application paperwork and brainstorm ideas for new chapters in their local areas.

IV.A: Evolutionary Ideas I

KOSC 104

Intelligent Design Theory: The God-of-the-Gaps Rooted in Concordism

Denis O. Lamoureux
St. Joseph's College,
University of Alberta

In their 1,000 page book *Theistic Evolution: A Scientific, Philosophical, and Theological Critique* (Crossway, 2017), proponents of Intelligent Design (ID) Theory have, for the first time, openly revealed the theological foundations of their antievolutionary views. During the last twenty-five or so years, ID theorists have repeatedly proclaimed that their view of origins is thoroughly scientific and they have carefully distanced their work from religion. As a consequence, they argue that their theory deserves to be presented in public schools and universities as an alternate scientific model to biological evolution.

Since its inception, ID Theory has been criticized for being a God-of-the-gaps understanding of the origin of living organisms. In the book that launched this modern antievolutionary movement, *Darwin on Trial* (1991), lawyer Phillip Johnson notes that his critics contend that "it is a grave error to insert God into scientific accounts of (say) the origin of life, because this creates a 'God of the gaps' who will inevitably be pushed aside as scientific knowledge advances." But the root of ID Theory has now been publically revealed. One-quarter of *Theistic Evolution* is a strident defense of a concordist hermeneutic that ultimately undergirds this antievolutionary God-of-the-gaps view of origins.

This presentation will demonstrate that ID Theory is a form of progressive creation. In failing to recognize that the Word of God features an ancient conceptualization of nature, and in particular the ancient biological notion of the immutability of living organisms, ID theorists employ the Bible like a book of science to undergird their God-of-the-gaps antievolutionism.

IV.B: Modern Technology III

KOSC 107

Transgenic Crops Perpetuate an Unsustainable and Unjust Food System

David L. Dornbos Jr.
Calvin College

Transgenes in industrialized agriculture perpetuate an environmentally unsustainable system that projects externalized costs on an unwitting public. Roundup Ready (RR), BT or corn rootworm resistant corn, and RR resistant soybean reduce yield loss to specialized crop pests problematic in monocultures. Monocultures promote soil erosion, biodiversity loss, and fresh water eutrophication, and they encourage a calorically rich but nutritionally poor diet. Transgenic crops can protect soil by enabling no-till production systems and increase labor efficiency. Traits like BT or RR are vulnerable to pest resistance when overused.

Genesis 2:15 commands us to "serve and protect" creation. Monocultures challenge our honoring the dual command by promoting species extinction, reducing plant capture of solar radiation, and encouraging production of low-quality food and animal feed. Functional biodiversity is required for effective natural biocontrol, effective in productive agroecological polyculture systems. Human foods derived from western food systems promote dietary patterns that contribute to chronic disease. Externalized costs from these systems include water treatment for pesticide and sediments, nutrient losses, and healthcare for chronic disease management.

Conflation of perceived need for transgenic crops with the industrialized agricultural system must be reconciled with the Creation Care mandate. For a consuming public to be autonomous about food choices and to promote nutritional justice, media should convey truthful messages about food system efficiencies and alternative agricultural system options.

IV.C: Faith and Science Education II

Jenks 237

Teaching Faith and Science without Losing Souls

George L. Murphy
Retired, Formerly
Trinity Lutheran Seminary

My title (which will be explained) plays on a thesis of Luther, and may serve initially to emphasize the topic's importance. I've engaged in it for forty years, with learners ranging from teenagers to seminarians and parish clergy. Such education is crucial for the church in today's world. The following points will be covered.

1. We may speak of "faith and science," but the real issue is relating our understanding of our faith, theology, to science.

2. Teaching Christians about this area isn't apologetics.

3. Theology should begin with Jesus Christ, crucified and risen.

4. Scientific knowledge should be placed in the context of our theology.

5. Still, science has its own integrity and can be learned and understood without reference to God.

6. Present real scientific facts and theories at a level appropriate to the audience.

7. If only a couple of sessions are available, stick to basics (how we can know about God and about the world, etc.) and don't jump into controversial topics immediately.

8. Brief case studies are a good way to get conversation going.

9. Don't assume that older participants are locked into obsolete views.

10. It's all right to say "I (or we) don't know," "I'll have to look into that and get back to you," etc. It's important for the church to be perceived as interested in these matters, not that it claims to have all the answers.

IV.D: Engineering and Appropriate Technology II

Jenks 226

What Does It Mean to Offer a Distinctively Christian Engineering Program? A Comparative Analysis of Program Educational Objectives

Gayle E. Ermer
Calvin College

There has been much reflection on the impact of a Christian worldview on technology development and engineering professional work. It has, however, been challenging to operationalize these perspectives into engineering curricula and to communicate the distinctiveness of Christian engineering education to students. This presentation will summarize the results of a research project focused on the following questions: What is distinctive about the engineering programs offered at Christian colleges or universities and what aspects of Christian faith are emphasized in different programs?

The methods used for this study will include qualitative analysis of the mission statement and associated program educational objectives (PEOs) of a variety of engineering programs offered at Christian institutions. According to ABET, PEOs are "broad statements that describe what graduates are expected to attain within a few years after graduation."

All accredited engineering programs are required to make public a list of PEOs. Several coding and analysis techniques will be used to identify common themes among programs, as well as emphases that differ between programs associated with different Christian traditions. This information will inform Christian engineering educators as they endeavor to more effectively integrate Christian faith into their own programs.

IV.A: Evolutionary Ideas I (cont'd)

KOSC 104

In Defense of Theistic Evolution

Randy Isaac
ASA

Ever since Asa Gray defended the compatibility of Christianity with Darwin's theory of evolution in the 19th century, there has been a controversy about what is generally known as "theistic evolution." When ASA was founded in 1941, DNA had not yet been discovered and there was considerable skepticism among ASA members about theistic evolution though with some cautious openness to it.

Richard Bube was one of the strongest voices articulating theistic evolution as a viable option for evangelicals. Gradually with growing compelling evidence, some form of theistic evolution seems to be the majority view held by ASA members, though by no means universal.

The latest critique of theistic evolution is collectively summarized in a 1,000 page volume published on November 30, 2017, combining the views of young-earth creationists, old-earth creationists, and intelligent design advocates. The book presents scientific, philosophical, and theological critiques in considerable detail proclaiming that theistic evolution is not a viable position for Christians.

This talk discusses the primary scientific critique offered in that book: the inability of evolution to generate information such as the genetic code. The claim is made in this presentation that the authors fail to make a compelling case and that theistic evolution, better known today as evolutionary creation, is not only a viable option for Christians but the only one. On the other hand, the contingencies inherent in evolution are difficult to reconcile with traditional views of Christian teleology.

IV.B: Modern Biotechnology III (cont'd)

KOSC 107

Mind the Gap: Christian Faith in Decisions about Fertility Treatments

Heather Prior and
Christianna Czyz
The King's College University

This qualitative research project explores the role of personal faith for Christian couples making decisions about assisted reproductive technology (ART). Academic discussions about the ethical use of ART are common in fields of bioethics, theology, and medicine. Many denominations have also developed formal statements about ART.

Our research shows that there is a "disconnect" (gap) between the academic discussions, denominational statements, and couples' personal decision making about ARTs. Many popular resources for patients focus on technical treatment information and emotional support through an invariably difficult journey.

Our research uses extended interviews to explore how faith influences decision making about these issues. We have also assessed web resources relevant to these issues and engaged local clergy in preliminary discussions about current practices.

Our research has formed the basis for the development of a website aimed at supporting Christian couples in a multi-faceted way in their journey through infertility.

IV.C: Faith and Science Eduction I (cont'd)

Jenks 237

Science as a Mediator between Religions

Dominic Halsmer and
Philip Riegert
Oral Roberts University

Perhaps one of the most divisive issues in Christianity stems from how we relate to the world through scientific ideas and endeavors. Many make claims that science and faith are incompatible, and many Christians ignore or attack scientific findings in order to maintain their grounding in the Word of God. Because of this tragedy, it seems that we have failed to anticipate the opportunity to use scientific pursuit as a means for building bridges between Christianity and other religions.

This presentation will look at the striking similarities in thought that Christians and those of other religions have when it comes to science, specifically, within the context of other monotheistic religions that hold to a similar creation story. There is an innate curiosity and desire for the truth that comes with any scientific endeavor. This curiosity could become a catalyst for setting aside religious dogmas and fears, and cooperating to discover what God has designed within our world.

Once this belief has been established, the presentation will look at how Christians could and should be using sciences of all disciplines to share the gospel with those of other faiths. The ability and desire to ask questions comes out of a scientific mindset. In many other cultures, this encouragement to question is often squelched; however, if it can be fostered in a scientific context, there is no reason to believe this cannot transfer across to religious beliefs. We, as Christians, hold to the belief that Jesus is the Truth, and once a pursuit of any truth is begun, it seems inevitable that, given enough time and resources, one finds themselves face to face with Christ.

IV.D: Engineering and Appropriate Technology II (cont'd)

Jenks 226

A Low-Cost Bodyweight Support Training System to Improve Gait

Jessica D. Ventura, Spencer Roffee, Ann L. Charrette, Katherine J. Roberts, Ross W. Lilley
Gordon College

In the United States, stroke is the number one cause of disability. Nearly two-thirds of stroke survivors have initial mobility deficits and six months after a stroke, up to one-third can still not walk independently. Gait training with body weight support can improve walking speed and endurance in post-stroke individuals. However, due to the high costs of gait rehabilitation equipment currently on the market, economic barriers limit access to therapies that utilize them. Individuals require 3–5 hour-long sessions each week over 6-week periods, repeated 2–3 times a year.

AccesSportAmerica has developed a fairly low-cost system that will enable convenient, frequent use that is required to improve gait. This machine alters stride length and hip and knee flexion of participants walking on a standard treadmill. The purpose of this ongoing study is to explore the biomechanical outcomes of training on the AccesSportAmerica Gait Trainer.

A pilot study conducted with eight participants found a mean increase in walking speed of 0.34 m/s ($SD = 0.34$, $p = 0.023$, $d = 1.20$) and a 10° increase in ankle range-of-motion ($SD = 6.4$, $p = 0.074$, $d = 1.06$). An increase in speed of 0.10 m/s is considered a substantial meaningful change in physical performance for community-dwelling older people and subacute stroke survivors.

The AccesSportAmerica Gait Trainer may lead to a cost-effective method of improving the gait of people with limited mobility.

IV.A: Evolutionary Ideas I (cont'd)

KOSC 104

Did God Guide Evolution?

Jim Stump
BioLogos

Part of the recent book *Theistic Evolution* is a "Philosophical Critique." There are not a lot of new ideas here, but there is one rhetorical strategy that intelligent design (ID) proponents have increasingly used that needs a clear response drawing on philosophy.

ID proponents have taken to asking those of us who accept the science of evolution and traditional Christian theism, "Did God guide evolution?" and they expect a simple "yes" or "no" answer. This puts us on the horns of a dilemma: if we answer "yes," they think we have conceded to an intervening God along the lines of ID; if we answer "no," they claim our God is not substantially different than the God of deism.

I will suggest that there is an implied premise in the question that forces us into the dilemma, namely, that God's action occurs at the same metaphysical level as the causes that science investigates. If that premise is rejected, we can affirm that God "guides" evolution in the same sense we affirm that God "creates," without thereby being committed to finding gaps in the scientific explanations where God can insert himself.

The problem lies in how to explain clearly and cogently the different metaphysical levels at which God's action occurs. Classically, Aquinas invoked notions of primary and secondary causation. That was helpful, but ultimately I will claim that contemporary philosophy of language gives us better resources to understand science and theology as different discourses. Each describes or "re-presents" an aspect of reality, but neither tells the whole story.

IV.B: Modern Biotechnology III (cont'd)

KOSC 107

Toward Standardization in Landscape Gradient Definition

Benjamin Padilla and **Chris Sutherland**
PhD Graduate Students, University of Massachusetts

Padilla and Sutherland Standardized methodologies across research programs are critical for developing a general understanding of spatiotemporal ecological processes. Urban ecology, one of the fastest growing subdisciplines of ecology, has been successful in describing patterns of ecological responses to urbanization, yet generalizable predictions across studies have been impeded by well-documented inconsistencies in how urban gradients are defined. In a recent review, Padilla and Sutherland (in-prep) advocate for a "full-disclosure" approach that requires candid reporting of three unifying decisions made in landscape gradient quantification that will increase overall reliability and repeatability.

Here, we present a general methodological workflow for generating objective and repeatable landscape gradients that requires explicit definition and justification of spatial scale, landscape variable selection, and data sources. Our method involves integrating kernel density smoothing of data at ecologically relevant scales with a multivariate ordination. Our approach describes two dominant axes of variation that hold across a range of landscapes: (1) a gradient of anthropogenic intensification describing variation from unmodified to modified landscapes, and (2) a gradient of anthropogenic transition describing a transition from agriculture dominant to urban dominant landscapes.

Applying our method to a variety of urban regions across the US, we demonstrate the reliability and ecological utility of our dual-axis gradient approach.

IV.C: Faith and Science Eduction I (cont'd)

Jenks 237

The Power of Praise and Encouragement in a Nontraditional Online Learning Environment

Effat Zeidan
Cal Baptist University Online and Professional Studies

As I began teaching science and math in a distant setting, I was intrigued by the challenge of instructor presence in online classes. Content delivery was performed using numerous interactive resources; however, digital interactions with nontraditional students was an area that could use some development in my classes.

During the accelerated eight-week courses, I recognized the great need for alleviating fear that our students experience from science and math in a distant learning environment. Our adult learners return after many years to pursue higher education with a culturally different perspective and different needs than recent high-school graduates. One of the challenges hindering performance and student ability to stay on task is anxiety from the subject matter—of being incapable of grasping concepts.

I practiced motivational and encouraging communication as a way to check in with my students. The strategy has shown its effectiveness in improved student performance in both my math and science classes. Currently, we are measuring the effectiveness of this approach through individual feedback from students.

We will be researching this aspect further in the upcoming classes as we implement motivational learning in more creative ways and develop controls to measure the resulting effect on student performance. It is important to note that this strategy does not eliminate constructive criticism to student performance; however, rewarding feedback enhances our teaching strategies.

IV.D: Engineering and Appropriate Technology II (cont'd)

Jenks 226

Asymmetrical Partnership: Models of Science and Religion Revisited

Mark McEwan
Project Development Officer, CSCA
Master of Theological Studies candidate, ACTS Seminaries

Introductions to science and religion generally describe four possible ways of relating the two, from least cooperative to most integrated. Two models consistently appear: (1) science and religion are in conflict (or warfare) over the same territory, and (2) they are independent, compartmentalized enterprises in which science explains "how" and religion explains "why." Other thinkers conceive the third and fourth models differently, but they generally include (3) an arm's-length option (e.g., Ian Barbour's "dialogue," John Haught's "contact," and Denis Lamoureux's "boundary"), and (4) a more integrated position, wherein the two fields deeply affect each other (e.g., "integration," "confirmation," and "complementary").

While quite helpful, these categories are not very explicit about the fact that science and religion can be integrated in both beneficial and detrimental ways. Drawing on Richard H. Niebuhr's five ways of relating *Christ and Culture*, and on Thomas F. Torrance's "modalities of reason"—in which science's "object" is nature, and theology's "object" is divine revelation—this talk reorients the discussion around (a) the distinctiveness of these objects and (b) the differing challenges we face in coming to know them. This reorganizes the taxonomy into five possibilities: conflict, independence, assimilation, dependence, and asymmetrical partnership.

Taking this fifth position, I argue that each discipline can indirectly aid the other in knowing its own object better: science can aid theology's understanding of revelation; theology can aid science's understanding of nature. However, *neither discipline can directly know the other's object for it*.

Examples of boundary violations between science and religion will be contrasted with mutually beneficial, asymmetrical partnership.

V.A: Medical and Clinical Issues

KOSC 104

The Unexamined Life of Public Health

David Sabapathy
Deputy Chief Public Health Officer
Province of Prince Edward Island

Public health is the science and art of preventing disease, prolonging life and promoting health through the organized efforts of society. In contrast with healthcare systems that care for the sick by means of hospitals, healthcare providers, and medications, public health strives to keep people healthy by preventing disease and injury before it occurs. Over the past century, global life expectancy has increased by over 30 years with much of this gain attributed to the field of public health.

Public health relies on science and technology to (1) identify cause-and-effect relationships (e.g., HPV and cervical cancer), (2) develop public health interventions (e.g., immunization, clean drinking water, motor vehicle safety), and (3) improve living conditions, which are a prerequisite for good health. However, public health is also directed by two moral imperatives: improving population health and reducing health inequity.

I will discuss how public health science and ethics rely on beliefs about the world in which we live. First, public health science, including epidemiology, relies on belief in a rational and ordered creation. Second, public health ethics, including the global appeal to health as a human right, depends on the concepts of intrinsic human value and distributive justice.

In practice, these beliefs are often assumed rather than examined. However, when we explore these convictions, we find that they are not autonomous but draw on a foundation provided by a Judeo-Christian worldview. Therefore, the hope for advancing public health depends on examining, reaffirming, and drawing on this foundation to improve health for all.

V.B: Culture, Science, and Faith

KOSC 107

How Liberal Protestants Bought White's Conflict Thesis and Lost Their Faith

Edward B. Davis
Messiah College

In the United States during the early twentieth century, liberal Protestant scientists and theologians were heavily influenced by Andrew Dickson White's infamous conflict thesis. Owing to White's famous two-volume book, *A History of the Warfare of Science with Theology in Christendom* (1896), they did not believe that traditional Christian theology had ever had a productive conversation with science, and they agreed with White's view that the route to progress involved leaving orthodox beliefs behind.

This presentation briefly reviews White's version of the history of science and presents specific examples of the ways in which White shaped the attitudes and ideas of several major Protestant scientists and theologians prior to World War II, most of whom were also leading public intellectuals: Edwin Grant Conklin, Harry Emerson Fosdick, Shailer Mathews, Samuel Christian Schmucker, and Gerald Birney Smith.

V.C: Faith and Science Eduction II

Jenks 237

Beaming Science Fiction into the Science and Faith Conversation

Andrew Walsh
Health Monitoring

Two hundred years ago, Mary Shelley's *Frankenstein* helped shape public conversations around the ethics of medical and biological experiments and introduced the Franken- prefix into our language. Fiction continues to reflect and influence how we talk about science. That influence extends to science and faith topics, providing convenient reference points for engaging wider audiences.

Some stories address faith topics directly. The popular notion that science deals in evidence while faith ignores it is fodder for drama and conflict; the TV series *Lost* literally identifies rival characters as a "man of science" and a "man of faith." Amusingly, scientists in Marvel comics and movies are skeptical of religion despite personal experiences with deities and the afterlife. *Star Trek* imagines a future in which any conflict is resolved by revealing religion as culturally idiosyncratic, while the Jedi of *Star Wars* blend science and technology into their practices. These stories provide common ground for conversations about fictional and factual perspectives on science and faith.

Science fiction also illustrates science and its metaphorical potential. *Jurassic Park* introduced many to chaos theory, a useful framework for discussing grace. Superheroes wrestle with dual identities, influencing how we assess the plausibility of Jesus's human and divine natures. *Arrival* demonstrates the cognitive power of language and a new word.

Whether introducing concepts we can affirm or providing models for critique, science fiction illustrations take what might seem abstract and unfamiliar about science and theology and make those ideas relatable.

V.D: Physical Sciences I

Jenks 226

The Problem of Faith in an Emergent World

Phyllida Drummond
Retired, North Island College

Does Christianity still make sense in an emergent world—a world in which we can accept entities and properties emerging, not as a composition of causes, but as an unpredictable novelty that is ontologically distinct from its constituent parts? Does faith become untenable, if we see consciousness and all the properties of consciousness, such as cognition, understanding, reason, and will, as emergent from the complex physical structure and chemical dynamics of the intact brain?

If life is emergent from the level of complexity reached by a membrane-bound cell, and if consciousness is emergent from a living, intact brain, then, by extrapolation, these emergent properties cease to be when the chemistry and/or physical integrity are radically disrupted. Death of any organism, but particularly of consideration here, the human being, would mean a complete end to existence. Therefore, what reason would we have to reflect on the four last things: death, judgment, heaven, and hell? And, if we have no need to reflect on them, what need have we of a savior?

Intuitively we know that there is more: more than emergent novelty evident in living systems, which is illustrated by the properties of physical life and consciousness. We know that the human person occupies a unique position within the animal kingdom. In his nature, not only are the physical realities of emergent novelty seen, but there also exists something other, a spiritual principle which is united to this physical reality and which continues in a mysterious integrity after physical and chemical collapse. Emergent novelty may be an explanation for the corporeal reality, but is it or is it not a barrier to belief in the spiritual principle of humans? And, since the human person is not a duality, how can we argue for faith?

V.A: Medical and Clinical Issues (cont'd)

KOSC 104

Insights from Sample Human Genome GWAS and Epigenome EWAS Projects

Jim Johansen
PhD candidate, Liberty University

This presentation examines sample findings from recent genome wide association studies (GWAS) and epigenome wide association studies (EWAS) projects and examines interesting insights that can be explored when considering them from a faith and science point of view.

Genome research is advancing from DNA sequencing to advanced techniques that map trait and disease relationships with the genome. With environmental adaptation, there are interesting epigenomic results that are being uncovered, showing examples of gene overriding behavior (e.g., methylation switching). Recent GWAS projects have done genotype imputation that shows substance abuse relationships. GWAS projects are mapping replicable genetic associations with behavioral traits.

EWAS projects have shown epigenetic evidence for such things as anxiety disorders, tendencies for suicide, and issues with anger. Several studies have shown statistically significant health impacts from individuals who have active experience with religiosity factors such as faith, prayer, and church attendance. There is room for more research in these interdisciplinary areas and are key in the author's ongoing research.

After summarizing these sample projects, a discussion of proposed insights will be given. Faith makes an impact in health and behavior, even overriding gene function in some cases. There is fascinating cellular function we are now gaining understanding about with its robustness and multi-layered complexity that can be appreciated more when including perspectives from faith.

V.B: Culture, Science, and Faith (cont'd)

KOSC 107

Science, Culture and Belief [Thomas Kuhn's Legacy]: Some Christian Reflections

Arie Leegwater
Calvin College
PSCF Book Review Subject Editor

In 1964, *Scientific American*'s short review of Thomas Samuel Kuhn's book, *The Structure of Scientific Revolutions* [SSR] (1962), ended with a veritable put-down: "much ado about very little." Today after more than a million and a half copies of SSR have been sold (its fourth commemorative edition is dated 2012); it may be necessary to take a second (or third, or fourth …) look at Kuhn's legacy.

I will trace some of the English responses to Kuhn's legacy (e.g., Martin Rudwick, historian of geology), as well as those by Robert Crease (an American physicist), French commentators Gaston Bachelard and Bruno Latour, and German historian of biology Hans-Jörg Rheinberger.

I will conclude with some Christian reflections suggesting how one may yet overcome the tension between a subjective and an objective view of scientific practice.

V.C: Faith and Science Eduction II (cont'd)

Jenks 237

Toward Thinking about Science from a Faith Point of View: Elements of a Strategy

Jimmy Davis and **Hal Poe**
Union University

This oral presentation will explore several tools to help students and science faculty members think about how to think about the sciences from a Christian point of view. This multifaceted approach involves using the affirmations of the Apostles' Creed as a matrix for exploring how each aspect of Creed (the gospel) has implications for different aspects of reality.

The second tool is an instrument that examines a disciple in terms of its subject matter, methodology, philosophical assumptions mingled with the discipline, relationship to other disciplines, values, controversies within the specific scientific disciplines, and what these guilds argue about.

The third tool involves the identification of the Big Questions that arise at the interface of science and Christian faith.

The fourth tool is a cultural analysis instrument designed to distinguish faith issues from cultural constructs that may have attached themselves to faith uncritically.

The presentation will present these tools and then demonstrate specific cases in which they are helpful in identifying science-faith issues and clarifying the nature of the issues.

V.D: Physical Sciences I (cont'd)

Jenks 226

A Brief Guide to Observing Invisible Matter

Matthew Solt
Grad student, Stanford University

Modern cosmology has a big problem: our current understanding of matter and gravity cannot account for velocity measurements of stars. They are orbiting the galactic center much too fast! This and a few other cosmological measurements reveal compelling evidence that our universe is dominated by an invisible matter called "dark matter." While we know regular matter is made up of protons, neutrons, electrons, etc., the fundamental nature of dark matter remains elusive even after several decades of intense searches.

During this time, the favorite hypothesis has been Weakly Interacting Massive Particles (WIMPs); however, after many years of null results, accessible parameter space for WIMPs will soon be excluded. This opens the possibility of novel dark matter scenarios.

One such model known as hidden sectors proposes an entire zoo of exotic invisible particles that do not interact directly with regular matter but can have complex self-interactions just like regular matter. A hidden sector could be detected through a limited set of "portals," one of which couples a hidden sector (or "dark" or "heavy") photon to our familiar photon. If they exist, dark photons would be associated with light dark matter, give rise to a new fundamental force of "dark electromagnetism" in the hidden sector, and leave a very distinct experimental signature.

This talk will review cosmological evidence of dark matter and its role in cosmic evolution, basic experimental techniques to detect various models of dark matter, possibilities of dark forces and hidden sectors, and philosophical implications of hidden sectors.

V.A: Medical and Clinical Issues (cont'd)

KOSC 104

Babble Boot Camp: Preventing Speech and Language Disorders in Infants at Genetic Risk

Beate Peter, Nancy Potter, Mark VanDam, Jennifer Davis
Arizona State University

Most children learn to talk nearly automatically, but some have severe speech and language disorders. Treatment is not started until they are 2–3 years old when the disorders manifest. Preventative treatment is not available. Children with classic galactosemia (CG) hold the key for investigating whether proactive measures can improve outcomes, as nearly all have disordered speech and language. Signs start with sparse cooing and babble in infancy; difficulties persist into adulthood. Because CG is diagnosed at birth, the known genotype-phenotype association can be leveraged to investigate preventative approaches.

Babble Boot Camp (BBC) is a program for children ages 2–24 months that stimulates/supports coo, babble, first words, word combinations, and social use of language via parent training. The first four infants with CG have recently completed year 1 of the BBC. All are on track with their speech and language development. One infant started BBC late and shows delays at 18 months, possibly due to frequent ear infections.

Results provide preliminary evidence toward a larger clinical trial. If successful, this program will change the treatment model in CG from deficit-based to proactive services and motivate testing the approach in other infants at risk, a translation of precision medicine into speech-language pathology.

V.B: Culture, Science, and Faith (cont'd)

KOSC 107

The Science/Faith Dialogue in the Local Church: A Leap of Faith

Patricia Fitzgerald-Bocarsly[1] and **Andrew B. Bocarsly**[2]
[1]Rutgers, New Jersey Medical School, [2]Princeton University

We reside in an area with a longstanding history of faith and science dialogues, going back at least to James McCosh, president of what is now Princeton University from 1868–1888. McCosh founded the Schools of Science, Philosophy and Art at Princeton, and, unlike most clergy of his time, was a solid defender of Darwinian evolution.

Today, Princeton remains a highly intellectual community, with scientists not only from the universities in the area, but also from local industry, which is rich in pharmaceutical, chemical, and environmental companies. Our church, Stone Hill Church (SHC) of Princeton, a medium-sized, nondenominational, evangelical church, has a more than 60-year history serving the community and is home to many professors in the sciences and engineering, and other scientists and physicians as well as serving the undergraduate and graduate populations of Princeton University and other nearby schools. Despite this environment, SHC had been largely silent on issues of science and faith.

We were aware of this void and prayerfully approached the Elders of SHC about starting a "Stone Hill Science" group; this proposal was enthusiastically approved by the pastors and elder board. The kick-off for the group was a seven-week adult Sunday school course that started in January 2018. The course drew the largest attendance of any adult class in our church history, with a maximum attendance of 75. Participants ranged from scientists to science-interested individuals and students from high school to post-doctoral fellows. The jumping-off text was the AAAS/NAE publication *When God and Science Meet*.

V.C: Faith and Science Eduction II (cont'd)

Jenks 237

Engaging Science and Faith in Core Science Curriculum at Gordon College

Jennifer Noseworthy
Gordon College

The Scientific Enterprise is a course offered to nonscience majors at Gordon College and seeks to promote science literacy and enhance their appreciation for science and faith.

The course explores characteristics of natural science and studies theories related to fundamental concepts that help the student understand patterns and processes in nature.

The course stresses relevance of science to contemporary issues and a Christian worldview.

The pedagogical approach is unique; elements of the course include a flipped-classroom model, use of group projects, and hands-on lab activities to engage students in science. These practices are aimed at maximizing student engagement by utilizing relevant technology and appealing to our liberal arts students' background in the humanities.

Through this course, students gain a greater appreciation and understanding of science, and are better able to return to their faith communities equipped to evaluate the validity of scientific claims.

V.D: Physical Sciences I (cont'd)

Jenks 226

Continents Did Not Sprint

Stephen Moshier,[1] **Kenneth Wolgemuth,**[2] and **Gregg Davidson**[3]
[1]Wheaton College;
[2]University of Tulsa, Founder of Solid Rock Lectures; and
[3]University of Mississippi

Catastrophic plate tectonics or "continental sprint" is a theory for rapid reorganization of Earth's lithosphere that would have accompanied the Genesis Flood, according to its originators. The theory borrows from basic concepts of plate tectonics (seafloor spreading, subduction, plate collisions) and continental drift that are supported by geological and geophysical research and measured by GPS. Their claim is that the current movement of lithospheric plates on the order of cm/year could have accelerated to m/sec through a process of rapid stress-weakening of the mantle resulting in runaway subduction and plate movement.

The concept of catastrophic plate tectonics is vulnerable at three levels that will be addressed in this presentation. First, the physical constraints of the model are unrealistic for actual Earth systems, materials, and conditions. Second, concordance between modern rates of plate motion and absolute ages for ocean crust and hot spot volcanic activity would require synchronous changes in ancient plate motion and radiometric decay rates. Third, the history of sediment deposition and rock deformation associated with the supercontinent of Pangea (which would have assembled and disassembled midway during the flood year) and global volcanic activity are inconsistent with the overall predictions of their model.

V.A: Medical and Clinical Issues (cont'd)

KOSC 104

Physician-Assisted Suicide: An Examination of Ethics and Dignity at the End of Life

Breanne Parets
Colorado Christian University

On November 8, 2016, the End of Life Options Act was passed by voters in Colorado, making it the sixth state to legalize physician-assisted suicide (PAS). Over the last few decades, support for PAS from the public and medical professionals has certainly grown, yet there is still marked opposition. Thirty-seven states have laws explicitly prohibiting PAS, and three more states prohibit it by common law.

This is certainly not a new issue: the Hippocratic Oath (ca 400 BC) manifests, "I will neither give a deadly drug to anybody who asked for it, nor will I make a suggestion to this effect." This oath, which has been considered the ethical guide for conduct in the medical field for centuries, clearly opposes PAS. Do those today who support PAS offer a superior ethical argument adequate to overturn this long-standing paradigm?

It cannot be denied that much is at stake pending the outcome of this bioethical conversation. At a minimum, a patient's freedom to choose and "right to die" is compromised when PAS is condemned, but a reevaluation of the axiom of the sanctity of life is necessitated if it is allowed.

After evaluating the terms of practice of PAS in the United States, considering the pertinent scientific background, closely examining the bioethical arguments both for and against its use, investigating the perspectives offered by Christian tradition throughout history, and carefully analyzing relevant biblical passages, it is concluded that PAS is impermissible within the framework of a biblical worldview.

V.B: Culture, Science, and Faith (cont'd)

KOSC 107

What, If Anything, Might Near-Death Experience Tell Us about Life after Death?

Walter Bradley
Baylor University

Is there life immediately after death or only when Christ returns and we get our resurrection bodies?

Is there scientific evidence that we have a body and a spirit/soul?

Does our spirit/soul continue to exist after our bodies die?

Does the Bible give any insight regarding what will be our situation between the death of our physical body and our receiving our resurrection body when Christ returns?

Key biblical passages and the more than 3,500 carefully documented cases of near-death experiences will be highlighted, giving compelling, empirically based answers to these questions.

V.C: Faith and Science Eduction II (cont'd)

Jenks 237

Framing Faith and Science Conversations Effectively

Walter A. Rogero II

Christians wishing to advance productive dialogue on morals and ethics at the nexus of faith and science can benefit from a structure that helps frame the question of reliable knowledge.

This session will suggest methodologies for developing such meta-frames between those of differing—even conflicting—viewpoints. These suggestions will draw from the presenter's field experiences as an active pastor in a theologically conservative setting, his doctoral research, formal missiological training, and lessons learned through his time as a Senior Program Associate at the American Association for the Advancement of Science's Dialogue on Science, Ethics, and Religion.

Further, the presentation will offer a model for mapping the distance between individual knowledge claims, and provide practical approaches to exploring and bridging these differences in real-word settings.

V.D: Physical Sciences I (cont'd)

Jenks 226

New Geological and Historical Evidence for the Date of Noah's Flood

Alan Dickin
McMaster University

More than the creation stories, our approach to the Flood story determines whether we can successfully situate Genesis inside the stream of ancient Middle Eastern history. Both biblical and Mesopotamian accounts describe the Flood as a cataclysmic event, which should have left a geological record in bore-hole sections from Mesopotamia. However, this region has been susceptible to flooding throughout the Holocene period, so it is necessary to know when to look.

Most evangelicals have searched for flood deposits within the historical period (around 2900 BC), based on the claims of the Sumerian King List. However, recent evidence shows that the earliest version of the Sumerian King List, from the late third millennium BC, made no mention of the Flood. Later versions of the King List placed the Flood within the historical past due to politically motivated developments in the early second millennium.

In contrast, biblical and Mesopotamian descriptions of the effects of the Flood are best explained by an event in prehistory. Such an early date for the Flood allows the rest of Genesis 1–11 to be properly situated in Mesopotamian history. For example, Genesis 1 resembles the cosmogony of Nippur, whereas Genesis 2–3 resemble the cosmogony of Eridu. This supports the claim of William F. Albright that "much of the early high culture of the Hebrews … contains elements brought from Mesopotamia during the time of the Patriarchs."

VI.A: Creation Care

KOSC 104

Creation Care and Environmental Justice: Closing the Concern Gap in the Area of Climate Change

Dorothy Boorse
Gordon College

People involved in caring for the environment in America are often separated along racial lines. Those in mainstream large conservation groups are more likely to be white, and those working with grassroots campaigns to protect communities from pollution are more likely to be people of color. We could describe this division as a difference in what threats people are reacting to.

People of color are more likely to have asthma, more likely to live near superfund sites, more likely to experience air pollution, and more likely to die in heat waves. They are more likely to be poor. Because of this, many of their concerns are not about the extinction of distant species, but about pollution in their surroundings.

Environmental justice is a place of overlap of concern for Christians involved in creation care. In the area of climate change, that overlap can be seen.

This talk examines climate change action as a place where environmental justice and racial reconciliation can be pursued. Some proposed solutions to climate change are likely to divide haves from have-nots and increase wealth inequality. Others are likely to improve society.

Christians have a role in collaborating with others and promoting ideas for climate change adaptation and mitigation that both solve environmental issues, and bring diverse groups together.

VI.B: Evolutionary Ideas II

KOSC 107

Intrinsic Biological Intelligence and Design

Sy Garte
Editor, *God & Nature*

Individual living cells exhibit a form of intelligence distinct from that of higher animals. All living creatures, including single cell organisms such as bacteria, possess a form of intrinsic biochemical intelligence (IBI) based on biochemical signaling and control systems that allows the organism or a community of organisms to communicate, learn, adapt, and choose actions based on knowledge of the environment. Cells can coordinate their behavior for more effective collective activity.

The communication signaling between and within cells have effects on enzymes, the genome, and organelles. These effects include changes in the expression of genes that lead to new phenotypes. The center of cellular biological intelligence is the protein synthesis or translation system that produces proteins with very specific functions. Each protein represents an individual “thought” of a cell.

The purpose of IBI is to allow cells to function at an optimum level, both as individuals and as community members. Furthermore, IBI allows for evolution, since the complex mechanism of protein construction by use of a genetic code and a mutable DNA sequence is able to produce designs that favor survival and reproduction. The implications of this idea for intelligent design, theistic evolution, and divine providence will be discussed.

VI.C: Physical Sciences II

Jenks 237

Causality/Teleology Symmetry in Quantum Mechanics

Dillard W. Faries
Wheaton College

The past is known or at least knowable and it represents a complete causal chain for the present and future. This mantra is a legacy of Newtonian mechanics and resulted in the belief in causality (efficient secondary causality from past to future) as an essential core of scientific thinking and in the effective elimination of any such thing as scientific teleology (final and formal causes which may effectively work from future to the past). To say this had an effect on the relationship of the scientific and the spiritual is an understatement.

Quantum mechanics, with acts of measurement by multiple-choice questioning of nature providing a step-wise historical and personal time which plays against a background of supposed continuum of abstract space and time, offers an alternative view. Looking at the simplest quantum mechanical of a two-valued system (“up” or “down”) in the directional (angular) continuum, we find a remarkable symmetry between measuring the past and “measuring” the future. We can “know” the future as well as we can “know” the past.

God’s activity and our activity in the supposed deterministic causal machine which we call our universe is much broader than that “allowed” by classical physics. Theology and life must be teleological and cannot thrive or survive in a purely causal world.

VI.A: Creation Care (cont'd)

KOSC 104

An Ocean of Plastic Hope

Robert D. Sluka
A Rocha

Reports suggest that plastic will eventually outnumber fish in the ocean. Marine plastic pollution is ubiquitous littering beaches, surface water, and even the deepest trenches. Is there hope for the ocean?

A Rocha's work on this problem is based on a model of combining scientific and theological reflection yielding appropriate resources and conservation activities.

This presentation will examine a case study from the Camargue region of southern France where A Rocha field work examined micro-plastic pollution among locations differing by level of development. We then reflected on the issue of plastic pollution through the lens of the great commandments to love God and love your neighbor.

This resulted in educational activities designed to engage heart, soul, mind, and body, culminating in the production of a Microplastics Toolbox which is available for others who want to develop local projects focusing on this issue.

Marine microplastics is still a young field with very little ethical and theological reflection applied. This holistic approach gives us hope for the ocean in a sea of plastic.

VI.B: Evolutionary Ideas II (cont'd)

KOSC 107

Evolution and the Pursuit of Beauty

David M. Buller
BioLogos

Recently, a small number of biologists have argued for a rethink of our understanding of the evolutionary origins of beauty. Rediscovering and building on Darwin's long-neglected theory of sexual selection, they counter the prevailing adaptionist view of beauty, which argues that animal beauty is prized by animals merely as "honest signaling" of a prospective mate's overall fitness. Instead, these scientists suggest that beauty is selected simply for the aesthetic pleasure it provides to the selector. If this is true, then it provides a much richer view of evolution and natural beauty, one with fresh and compelling insights for those in the science and religion dialogue.

This presentation will introduce this renewed theory of "aesthetic evolution" through sexual selection, as well as its differences from purely adaptionist neo-Darwinian evolution, and explore several takeaways for the science-religion dialogue: (1) a broader view of beauty, recognizing that there is more beauty in nature than what an anthropocentric perspective alone can discern; (2) that appreciation of beauty grows out of the evolutionary process (rather than being supernaturally gifted directly to humanity); and (3) that evolution is not only a process to increase and diversify life in Earth's ecological niches, but a process to increase and diversify a kaleidoscopic variety of beauty on Earth and the free choice of living things in pursuit of that beauty. Through the eyes of faith, these scientific insights further reveal evolution as a process for the creation of "endless forms most beautiful" that glorify their Creator in myriad ways.

VI.C: Physical Sciences II (cont'd)

Jenks 237

Balls, Strikes, and Truth in a Postmodern World: Holding On to Robust Truth Even When We Can't Be Certain

Chris Mulherin
Executive Director of ISCAST–Christians in Science and Technology (Australia)

In this talk I will share some of my doctoral research, which goes by the acronym HUFPAT: a hermeneutic, universal, fiduciary, and provisional approach to truth.

I will explain why scientific and theological knowledge are very similar in many ways and why confusion about the nature of science has led fundamentalists (secular and religious) into blind alleys. To put it more technically, I believe that HUFPAT is the unavoidable condition and also the common practice of knowledge claims in areas as diverse as theology, history, the appreciation of art, and the natural sciences. In short, all knowledge is "hermeneutic."

HUFPAT affirms a robust understanding of truth while at the same time recognizing the validity of criticisms of overly ambitious epistemologies. Both the natural and the human sciences offer legitimate and similarly founded truth claims which avoid falling into the extremes of either a naive optimism, based on method and the disengaged human subject, or a relativism that cannot make universal truth claims.

HUFPAT is based principally on the work of the German philosophers Martin Heidegger and Hans-Georg Gadamer (who gave his last public lecture at 101 years of age!), and Hungarian/English scientist and philosopher of science Michael Polanyi.

1

Caring While Carrying: How Do Social and Moral Constraints Affect Physical Motion?

Rachel Allison, Jordan Dorelus, Jessica Ventura, Bert Hodges
Students, Gordon College

What defines being careful? Hodges and Lindhiem found that observers perceived that parents carrying their child across uneven terrain were more careful than when carrying a bag of groceries or trash. However, the study did not attempt to quantify carefulness using physicalmeasurements.

Monsch et. al. compared gait patterns of subjects instructed to walk downhill using conservative versus risky strategies. Subjects using conservative gait strategies were found to have decreased stride periods and stride lengths and an increase in metabolic rate.

In this study, rather than instructing subjects to walk in a conservative manner, we tasked them with carrying objects of differing social and moral value. Twenty parents carried their child, a sack of equally weighted groceries, and a bucket of water across a level floor and across an uneven set of steps. Body motion was measured with a six-camera infrared system and ground reaction forces were measured with two strain-gage force plates hidden in the walkway.

We will be assessing differences in stride rate, double support time, hip and knee range of motion, and peak force generation between the different conditions. Psychologists and movement scientists have no common theory of what it means for movements to be careful. The proposed research begins to address this issue.

2

(gc)2: Gordon College's Commitment to Green Chemistry

Quincy Dougherty, Lian Atlas,[1] Victoria Ganss, Anna Kjellson, Sara Lareau, Irvin J. Levy
[1]Student, Gordon College

Green chemistry is at the core of the Gordon College American Chemical Society student chapter's activities. Our commitment to green chemistry begins with educating our members and campus about the importance of practicing chemistry that is safer for human health and the environment. This is done by attending green chemistry workshops and hosting an annual green chemistry lecture, where an expert in the field of green chemistry is invited to give a public lecture at our college.

The next focus of our chapter is to share our knowledge of green chemistry with the community, especially with the younger generation, through outreach activities. Our outreach has no boundaries: we have invited young children to campus as well as traveled off campus, both in our local region and in other states, to reach students of all ages.

We teach the importance of green chemistry through fun, hands-on activities, demonstrations, skits, and presentations. We also partner with the nonprofit organization, Beyond Benign, to make green chemistry as exciting as possible.

By teaching our campus and the community about green chemistry, we are educating the next generation of scientists and promoting the movement to a more sustainable future.

3

Geology and Landscape: The Key Factors for the Inscription of the Italian Dolomites in the UNESCO World Heritage List

Andrea Casazza
Official Italian Association of Professional Geologists, Registration # 957 in Lombardy

Since June 2009 nine main areas of the Italian Dolomites have been listed in the UNESCO (United Nations Educational, Scientific and Cultural Organization) World Heritage. This decision was taken on the basis of two foundamental criteria: one regards the global significance of the geological and geomorphological values and the other regards the outstanding aesthetic beauty of the landscape.

The UNESCO World Heritage requires that site management plans have to be adopted and performed based on a shared vision for the future of the site for the long term, and it outlines actions and priorities to implement them.

This poster is intended to present examples of this heritage, by taking as example the territory of the Val di Zoldo, Province of Belluno, Veneto Region (NE Italy) where there are two areas partially included in the UNESCO World Heritage list: Mt. Pelmo (UNESCO system #1) and the Bellunesi Dolomites (UNESCO system #3).

4

How Green Chemistry Can Impact Social Justice Education

Verna Curfman
Student, Gordon College

Education is the most important tool that we have for furthering the ideas of how Green Chemistry applies to social justice. Future generations need to understand the connection of these topics and their role in encouraging the fair treatment of others in the context of sustainability and environmental justice.

The Gordon College student chapter of the American Chemical Society has been addressing education developments in schools in Lawrence, Massachusetts, and in Harlem, a section of New York City, that are either failing or in great need of curricula resources.

This poster seeks to create a space for conversation about ways to increase resources for further opportunities on this topic.

5

Changing the Course of Chemistry: Adopting the Green Chemistry Commitment

Mollie Enright[1] and **Irvin J Levy**[2]
[1]Beyond Benign, Wilmington, MA,
[2]Gordon College

For two decades individual faculty from various colleges and universities have brought green chemistry, emphasizing materials and methods that are inherently safer for human health and the environment, to their students and research programs.

As global calls for sustainability in the chemical enterprise ramp upward, the need to more widely integrate green chemistry into the background of all our students becomes imperative. We need to prepare students to be competitive in the workplace and to solve important problems that they will encounter.

The Green Chemistry Commitment (GCC) is a national project that seeks to encourage colleges and universities to commit to changing the education of tomorrow's chemists. Currently 42 colleges and universities are participating—from large universities to small colleges to community colleges. The flexible framework allows all to participate in ways that best fit the local needs of an institution.

We will discuss how to adapt the GCC framework to a wide range of colleges and universities, hopefully encouraging additional participation throughout the Southeast region.

More information at: http://www.beyondbenign.org/he-green-chemistry-commitment/.

6

Fostering Creativity

Fraser Fleming
Drexel University

Creativity is central to personal fulfillment, reflecting the creativity of God the supreme Creator. Despite the centrality of creativity to academic pursuits, creativity and problem solving are seldom directly incorporated in the curriculum.

This poster will describe the development of a graduate minor in Creative Interdisciplinary Research at Drexel University: the challenges, content, and structure of the program.

The goal of the program is to train students to be creative, innovative problem solvers through evidence-based pedagogies with demonstrated effectiveness in interdisciplinary team-based research.

Professional success requires creativity, problem-solving ability, and competency working in interdisciplinary teams, but seldom are these skills directly taught. Yet creativity lies at the heart of transformative innovation and is an innate part of the lived experience that drives researchers to seek new heights.

The program addresses this deficiency through a blend of teaching, coaching, and team exercises augmenting modern creative theory with practice in an interdisciplinary research environment. At the core of the minor are two courses in which interdisciplinary teams learn and exercise skills to purposefully increase creative practices and problem-solving ability.

A familiarity with recent advances in creativity research and practice form the basis for team-based solutions that address societal problems and improve students' research ability.

7

A Promising Virus

Esita Harper
California Baptist University

Oncolytic viruses have long been of interest in cancer research. The discovery and creation of engineered viruses have become the newest promising focus in this arena.

Colleagues at multiple universities, such as the University of Miami and the University of Calgary, are in the process of finalizing engineered oncolytic viruses after decades of research.

Oncolytic viruses are drawn toward attacking malignant cells. Scientists are hoping to increase their tumor selectivity and attacking mechanisms through virus engineering.

The properties of viruses make them an ideal cancer fighting mechanism. Viruses, by nature, attack a healthy host cell's machinery which then enables the virus to replicate by feeding on raw materials produced by cells. This can be exploited in fighting cancer cells which produce raw materials at a rapid pace.

Viruses also cause cells to self-destruct upon exiting the host cell. In addition, they have immune response properties that can aid in reducing malignant tumors. With the help of viruses, immune cells are signaled to their location and some get redirected to the cancer cells, thus destroying them.

With these characteristics, engineered super-viruses are being fine-tuned and are becoming a promising tool in the fight against cancer.

8

A Teaching Strategy to Address Origins in a Microbiology Course for Nonmajors at a Christian University

Joanna R. Klein
University of Northwestern, St. Paul

Christian students often question how to integrate their faith with the scientific information they are learning in the classroom. One issue at the forefront is how to relate scientific and biblical explanations of origins.

A growing body of evidence suggests general practices by science instructors that can reduce students' perceived conflict between evolution and Christian faith, such as describing the spectrum of viewpoints, teaching the nature of science, and providing examples of Christian scientists who view the two as compatible.

Implementation of these practices will vary in form, and may utilize a variety of published resources such as articles, books, and videos. As educators seek to demonstrate that students have achieved defined learning outcomes, it is important to assess the effectiveness of any curriculum.

To this end, I have tested the effectiveness of a curriculum I used in a nonmajors microbiology course at a Christian University. A unit centered around the book *Origins: Christian Perspectives on Creation, Evolution, and Intelligent Design* by Deborah and Loren Haarsma was embedded in the course, wherein students participated in an online discussion forum concluding with a final written reflection.

To test the effect of this curriculum on student perception of the conflict between evolution and religious faith, a survey was administered before and after students read the book. Findings from this study will contribute to a growing body of research that explores the effectiveness of teaching methods and materials for evolution education and will inform future instruction.

9

Genesis and Evolution

Tom Larkin
UMass Medical School
Biologic Laboratories

There are two creation stories in the Bible: the first is recorded in Genesis 1:1 through 2:4, and the second is recorded in Genesis 2:5 through 2:15.

This poster presentation will demonstrate that it is more consistent with the remainder of Genesis and the Bible that these are two distinct and sequential events. The order of events is very different in each account which will generate contradiction if the second story simply is intended to provide additional detail for the first story.

Throughout Genesis and the Old Testament, the genealogy of the line (or lines) not leading to the Messiah is always given prior to the line leading to Messiah. The first creation story (Gen. 2:4) concludes, "These are the generations of the heaven and the earth …"

The "male and female" (Gen. 1:27) that God created lived, I think, before Adam and Eve and are consistent with the "daughters of man" in Genesis 6:4.

The offspring of Adam and Eve are described as the "sons of God," which is why it was critical that Noah was of the line leading to the Messiah and "perfect in his generations" (Gen. 6:9).

I feel that the sequential nature of the two creation stories eliminates Adam as the first man ever created and thus eliminates the conflict between the Bible and the theory of evolution, while maintaining the historical character of Adam.

10

Antibacterial Activity of Selected Plants from Southwest USA

Zachary Merhavy,[1] **Cheney Huls**,[1] **Thomas Varkey**,[1] **John Varkey**,[1] and **Ramesh Velupillaimani**
[1]Students, Grand Canyon University

The emergence of drug-resistant microorganisms has posed important public health problems. The annual cost of treating antibiotic-resistant infections in the US alone has been estimated to be as high as $30 billion. This has led to an urgent need for new antimicrobial drugs, particularly from natural resources.

Phytochemicals obtained from medicinal plants have been used widely in the development of novel therapeutics, including antimicrobial agents. Therefore, it is imperative to detect substances which have an inhibitory effect on the growth of bacterial species. Ethanol (80%) extracts of leaves of several plant species from southern Arizona were screened for their antimicrobial efficacy against *Staphylococcus epidermidis, Mycobaterium smegmatis*, and *Streptococcus mutans*. Extracts were prepared by maceration process, and antibacterial activity of different plants was evaluated and compared by measuring their zones of inhibition.

The results indicated that *Lagerstroemia microcarpa* and *Myrtus communis* leaf extracts were highly effective against all the test bacteria. The leaf extract of *Condea emoryi, Gaura angustifolia, Tribulus terrestris, Cercidium hybrid, Celtis occidentalis, Lantana camara, Fallugia paradoxa, Hamelia patens, Thelesperma, Vachellia rigidula, Mahonia aquifolium, Olea europaea,* and *Chilopsis linearis* showed moderate activity. However, the leaf extracts of *Calliandra californica, Pedilanthus macrocarpus* and *Celtis ehrenbergiana* were effective only against *M. smegmatis*. The minimum inhibitory concentration and minimum bactericidal concentration of crude ethanolic extracts and thin-layer chromatography isolated factions will be tested against bacterial strains. Further screening and identification of novel antimicrobial compounds from various plant extracts will be discussed.

11

Using FRET to Elucidate the Lipid Trafficking Mechanism of SP-B C and N Terminal Peptides in Comparison with KL_4

Amanda Page
Student, Gordon College

Infant Respiratory Distress Syndrome (IRDS) is a disorder which commonly affects premature babies. It is caused by a complete or partial deficiency of lung surfactant (LS), a film that lowers the surface tension of the alveoli, permitting inflation and oxygen exchange at ambient pressure and preventing collapse during respiration. Specifically, surfactant protein B (SP-B) has been shown to play an essential role in surface tension reduction, though how it functions is largely unknown.

A structurally simpler synthetic peptide, called KL_4, is used for IRDS treatment. It mimics the carboxyl-terminus of SP-B and has been shown to lower the alveolar surface tension at the air-fluid interface.

We compared the functions of SP-B's two functional units: its carboxyl-terminus and amino-terminus, with KL_4 by individually studying the proteins' interactions in a liposomal environment. Specifically, we studied how the peptides mediated membrane fusion of liposomes by observing the FRET phenomenon when the two probes NBD-PE and Rhodamine-PE were in close proximity. This allowed us to see how SP-B amino and carboxyl terminal peptides and KL_4 interact with surface lipids and, therefore, lower surface tension.

Through this study, SP-B's complex function can be further elucidated.

12

Remote Respiratory Allergen Challenge Increases the Frequency of Small Intestinal Eosinophils in Allergen-Sensitized Mice

Grace Peppler
Student, Gordon College

Accumulated data suggest that allergic sensitization predisposes susceptible individuals for the development of eosinophilic gastrointestinal (GI) diseases.

GI allergic manifestations are observed in asthmatic, allergic rhinitis, and atopic patients; and eosinophilic esophagitis (EoE) patients exhibit higher rates of aeroallergen sensitization than the general population. Several clinical studies directly implicate aeroallergens in the pathogenesis of EoE.

These findings suggest that susceptibility to intestinal allergic inflammation may be enhanced by allergen exposure of the skin or respiratory mucosa. However, the interplay between allergen exposure to the skin or respiratory tract and remote eosinophilic GI inflammation remains enigmatic.

13

For Everything There Is a Season: Molecular Regulation of Insect Diapause

Julie Reynolds
Ohio State University

Insects, and many other animals, survive seasons of harsh environmental conditions by entering diapause. Diapause is a specific type of dormancy that is characterized by arrested development, depressed metabolism, and increased resistance to environmental stressors.

Entering diapause not only allows insects to survive periods when the environment is unhospitable, but also allows populations to synchronize periods of growth and reproduction with seasons of optimal temperatures and abundant food sources.

Diapause is endogenously regulated by a network of hormones and other signaling molecules that provide a means for insects to translate perceived changes in the environment into a coordinated biochemical and physiological response. Accumulating evidence suggests that microRNAs may be important regulators of diapause in flies, mosquitoes, and moths.

MicroRNAs (miRNAs) are small (18–25 nucleotide), noncoding RNAs that post-transcriptionally regulate gene expression of target genes and inhibit their translation to proteins. MiRNAs regulate a number of diapause-relevant biological functions, including developmental timing, cell-cycle progression, metabolism, and stress resistance.

This study investigates changes in the abundance of candidate miRNAs including, but not limited to, miR-305-5p, miR-277-3p, and miR-289-5p in diapausing insects compared to their nondiapause counterparts. It also discusses their possible role in regulating insulin signaling, developmental timing, and other aspects of the diapause.

14

Microbiology through the Lens of the Bible: Antimicrobial Products from Sonoran Desert Plants

Daisy Savarirajan and **Ramesh Velupillaimani**
Grand Canyon University

Microorganisms help answer key questions about the origin of life and affirm the creation account in the Bible. Professors are considered the primary influence in the integration of faith and learning. A biblical approach to science research involves discipling students to become followers of Christ and to prepare them for healthcare-related professions.

The global burden of bacterial infections is very high and exacerbated by increasing resistance to multiple antibiotics. While the problem of antimicrobial resistance (AMR) continues to worsen, few to no novel antimicrobials are presently in the drug development pipeline. Moreover, tackling AMR becomes an ethical obligation, because the prospect of declining anti-infectives affects everyone. To overcome AMR, it is necessary to identify new antimicrobial agents.

The Bible is replete with plants for healing. Desert plants synthesize a wide variety of secondary metabolites to survive adverse conditions of the arid zone. With the incredible diversity of plants still unstudied, the future for medicinal discoveries is promising.

In this poster presentation, we provide an overview of our research study to discover novel antimicrobial products from diverse desert plants and address the need for safe and effective antimicrobial agents against drug-resistant microbes.

The specific rationale underlying this research is engaging students in Christian education to generate global scientist-citizens equipped with scientific knowledge to solve society's pressing problems.

Ultimately, this project's benefit to society is drug discovery, producing an educated Christian community that can be aware of, and participate in, scientific and human health-related decisions facing the global population.

15

Developing Optimized Sortases for Investigating Cellular Trafficking in Animal Models

Craig Story
Gordon College

New biochemical tools continue to provide ever more detailed insights into cellular and organismal function. The enzyme sortase is used by Gram-positive bacteria to join new protein subunits onto the growing pilus structure, and has been employed as a peptide ligase to perform interesting biochemistry as a purified enzyme. The sortase A enzyme (SrtA) from *Staphylococcus aureus* has been enzymatically optimized by us and other researchers through mutagenesis, and is typically purified from an *E. coli* expression system.

SrtA substrates include one containing a 5-amino acid motif, the so-called sorting signal, Leu-Pro-Xxx-Thr-Gly (LPXTG), at or near the C-terminus, and a second substrate with a poly-glycine sequence on its N-terminus. The sortase reaction results in a peptide bond between the Thr of the sorting signal and an N-terminal glycine of the second substrate, creating a peptide bond between the two substrates. Sortase together with LPXTG-containing artificial substrates, such as fluorescent dyes, have been used to fluorescently label cells via available N-terminal glycine residues displayed on the cell surface.

We recently reported a new sortase variant that combines multiple mutations, yielding an enzyme that was both calcium-independent and highly active. This variant has superior activity over other previously described calcium-independent sortases for both N- and C-terminal labeling, as well as cell surface modification under physiological conditions.

Here, we further characterize sortases optimized for mammalian expression. A potential use of this mammalian-optimized sortase would be to label cells that encounter tissues expressing the sortase *in vivo*, such as in mouse tumor models.

16

Protein Kinase D3 Strengthens Barrier and Mounts an Early Innate Immune Defense Against Invading Respiratory Infections

Janelle Veazey,[1] Timothy Chapman, Timothy Smyth, Sara Hillman, Zackary Knowlden, Sophia Eliseeva, Steve Georas
[1]Student, University of Rochester

Protein kinase D (PKD) is a serine/threonine kinase family expressed in most cell types, including the epithelial cells that constitute the body's first line of defense. The three isoforms PKD1/PKD2/PKD3, are implicated in numerous pathways, including cell growth, differentiation, proliferation, motility, and secretion. However, the function of PKD in the lung during infection is understudied.

We found that PKD3 is the most highly expressed isoform in the human bronchial epithelial cell line (16HBE). Treating 16HBE cells with double-stranded RNA (polyI:C), a mimic of viral infection, we found that PKD regulates barrier integrity and early immune signaling. Specifically, inhibiting PKD activity with CRT0066101 prevented polyI:C-mediated disruption of the tight junctional network responsible for epithelial barrier integrity. Furthermore, PKD inhibition significantly reduced pro-inflammatory signaling molecules such as interferons and interleukin-8. Similarly, PKD inhibition in mice limited a wide array of pro-inflammatory mediators and immune cell accumulation in the lung. Additionally, PKD inhibition protects mice from "outside-in" leak (amount of fluorescent probe lost from airspace). Importantly, mice deficient in PKD3 exhibited a phenotype similar to PKD inhibitor-treated mice, indicating PKD3 is the isoform driving the observed results.

PKD3 is a critical player in the host's fight against pathogen invasion. Epithelial cells are the first to encounter pathogens and our work indicates that PKD3 is critical for initiating the first wave of pro-inflammatory signals needed to activate other cells of the immune system. We also find PKD3 disrupts the epithelial barrier, allowing immune cells to access the invading pathogen.

Funding: The project described was supported by Award Number T32AI007285 from the NIAID, and by R01 HL12424, and F31 HL140795 from NIH/NHLBI.

17

God's Solar Cells: Light-Harvesting Role of β-Carotene in the Photosystem I of Eukaryotic *Chlamydomonas reinhardtii* Cells

Ramesh Velupillaimani,[1,2] Daisy Savarirajan,[2] K. Gibasiewicz,[3] Su Lin,[1] Andrew N. Webber[1]

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Solar cells produced by technology after centuries of research, were already created in the beginning by God. Green algae are miniature marvels that function to capture and convert solar energy into chemical energy. Carotenoids (Cars) are tetra-terpenoid (40-carbon isoprenoid) pigments synthesized by plants, algae, some fungi and few bacterial members. Cars serve as protective agents, which are essential structural components of photosynthetic complexes and membranes, and they play an important role in the light harvesting mechanism of photosynthetic organisms.

In the present work we investigated the light harvesting role of β-carotene in PSI of eukaryotic *Chlamydomonas reinhardtii* cells. Using ultrafast laser spectroscopy, we determined the overall efficiency of Car to Chl excitation energy transfer in eukaryotic PSI. Selective excitation of β-carotene with a femtosecond (fs) laser indicated the singlet excitation energy transfer from β-carotene to Chl α molecules.

The data show that the Chl QY bleaching developed mainly within the first 500 fs due to an efficient Car S2 to Chl excitation energy transfer. The Car S1 to SN signal reaches its maximum within the 500 fs. Further excitation energy transfer from Car to Chl occurs on a picosecond time scale. No significant further growth of the Chl QY band is accompanied with the decay of the carotenoid S1 state. Hence, dominated energy transfer pathway is from the Car S2 state to the chlorophylls, probably via the Chl QX state, on a hundreds of femtosecond time scale. The efficiency of energy transfer from the Car S1 state to the Chl QY state is low, it is estimated to be less than 10% of the overall transfer efficiency.

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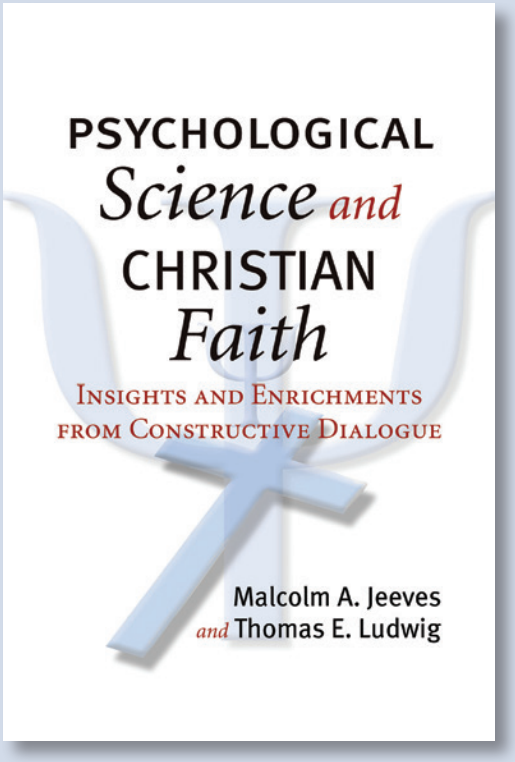

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