

Fostering Enthusiasm for Engineering in America's Bible Belt by Demonstrating Consonance with a Theistic Worldview

Dominic M. Halsmer, P. Wesley Odom
Oral Roberts University
7777 South Lewis Avenue, Tulsa, Oklahoma 74171

Abstract

STEM fields are often portrayed by popular writers and the media as being necessarily antithetical to traditional religious beliefs. Anecdotal evidence suggests that this may be part of the reason why many capable young people are shying away from pursuing these areas of study. A three-year grant from the BioLogos Foundation is helping to dispel this misguided notion in Northeastern Oklahoma through publications and presentations by a multidisciplinary team of faculty and students from Oral Roberts University. This project is an effort to translate information from the academy to the Christian church, to help her appreciate the findings of mainstream science, while also respecting her religious convictions. Initial survey results indicate that this project is fostering an appreciation for the amazing ingenuity that underlies our evolving universe, as well as an increasing enthusiasm for engineering and science.

Worldviews in Conflict

Books like biologist Richard Dawkins' *God Delusion*¹ and more recently *The Magic of Reality: How We Know What's Really True*² paint a picture of STEM fields that is necessarily in conflict with belief in God. They seem to be written in order to convince people that religious faith should be seen as unreasonable if one is scientifically enlightened. Having taught engineering at a Christian University for 22 years and spoken with many students and parents about these issues, it is clear that this kind of polemic material also has the effect of discouraging young people from pursuing studies in science and engineering. Most people naturally tend to avoid conflict, and the idea that science and faith don't mix provides one more reason for the spiritually-minded to choose a different major in college. In his book, *Where the Conflict Really Lies*,³ philosopher Alvin Plantinga argues persuasively that it is not science and faith that are necessarily in conflict, but rather the worldviews of naturalism and theism. Theologian Alister McGrath agrees with this assessment as described in his book, *Science and Religion: A New Introduction*.⁴ These works help to dispel the myth of conflict between science and religion that seems to be so prominently promoted by the popular media.

Never-the-less, the perception among many young people is that the typical American church is out of touch with today's scientific and technological society. This is one of the theses asserted by David Kinnaman, President of the Barna Group, in his book, *You Lost Me: Why young Christians are leaving church...and rethinking faith*.⁵ Kinnaman reports that 52% of youth group teens in one survey aspired to science-related (medical and health professions, engineering, science, technology, and veterinary medicine) careers, but that only 1% of their youth pastors addressed issues of science in the past year.⁶ Another Barna survey of youth with a Christian background provides an interesting confession of their thoughts on these issues. 52% agreed that

Christians are too confident that they know all the answers. 41% agreed that churches are out of step with the scientific world we live in. 34% agreed that Christianity is anti-science. 34% agreed that they have been turned off by the creation-versus-evolution debate. 29% agreed that Christianity makes complex things too simple. And 26% agreed that Christianity is anti-intellectual.⁷ Perhaps the church could do a better job of helping young people sort through issues of science and faith. A group of faculty and students at Oral Roberts University think the field of engineering has an important role to play in addressing this need, as described below.

Should Religious Believers Be Involved in STEM Fields?

Because of this apparent conflict between science and religion, the question may be raised, “should those of religious faith be involved in the STEM fields at all?” This is a valid question. The integrity of scientific research is at stake if many of those involved are influenced by beliefs which have the potential to corrupt proper and effective scientific methods.

There are two avenues which can be surveyed to lend some insight into this question, those being historical progress and modern progress within the STEM fields. Historically, many of the greatest thinkers were associated with the Christian faith, prominent figures such as Copernicus, Galileo, Kepler, Newton, and Boyle, just to name a few. Looking at a survey of the 100 years of Nobel prizes awarded between 1901 and 2000 yields some insight. 65.4% of the Nobel Prize Laureates during this period claimed affiliation with some form of Christianity. Looking more closely, it is seen that 72.5% of Nobel prizes in chemistry, 65.3% of those in physics, and 62% of Nobles awarded in medicine were received by scientists who adhered to some form of Christianity.⁸ The purpose of bringing forth these statistics is not to diminish the validity of those not associated with a faith in God. This data is meant only to affirm the legitimacy of those thinkers of faith who coincidentally desire honest and thorough progress in the STEM fields. Thus far, this only addresses Christian thinkers in science, while there are many more people of other faiths also intimately involved in the good progress of science.

Based on this data, it could be argued, that the STEM fields have benefited greatly and will continue to benefit from the involvement of religious individuals. It shows minimal signs of suffering from their involvement. What needs to be addressed now is the false contention between faith and science. The fallacy that the truly inspired scientists are those that have rejected the idea of a God should be exposed. There needs to be a great deal of effort given to reaching out to youth within religious faiths. Not to try and “fix” their worldview based on one’s personal belief system, but to foster a curiosity about the universe, that they may be taught how to explore and think critically, coming to their own conclusions, and refraining from coercion.

Bringing Engineering into the Dialogue

In January of 2013, a three-year \$160k grant was received from the BioLogos Foundation⁹ to fund a project entitled, *Science and the Wisdom of God: An Interdisciplinary Project to Help Christians Gain an Appreciation for the Ingenuity Behind our Evolving Universe*. The principal investigator for this project is a Professor of Engineering at Oral Roberts University, former Dean of the ORU College of Science and Engineering, Director of the ORU Center for Faith and Learning, and the primary author of this paper. He has gathered a team of faculty with

experience in engineering, science, history, education and theology to assist with this project. He also directs a group of about ten undergraduate students (mostly engineering majors) who regularly conduct research on the role of engineering in the science and faith dialogue.

The project team has committed to make at least 250 presentations over the duration of the grant to help support Christian groups in reconciling their biblically-based faith with the findings of mainstream science. How can expertise from the field of engineering assist in this goal? Much of the science and faith dialogue focuses on the question of design in nature. Design is the forte of the engineer. Engineers know how to design complex systems, and they recognize instances of design in nature.¹⁰ They are adept at reverse engineering analysis,¹¹ which has been found to be extremely useful in the recently exploding field of systems biology.¹² They recognize engineering design principles in the layout and fine-tuning of the universe for life.¹³ Previous research has also shown that an engineering mindset is helpful in evaluating various worldview options.¹⁴ In addition, encouraging students to make connections between engineering and human spirituality is seen to be an important aspect of a whole-person education.¹⁵ Although ORU is a Christian institution, students are encouraged to wrestle with these issues and come to their own conclusions based on the evidence from all pertinent fields of study.

Examples of Ingenuity in Nature

According to Mechanical Engineering Professor Robert L. Norton, a machine is defined as “a system of elements arranged to transmit motion [and energy] in a predetermined fashion.”¹⁶ While it may seem unusual, or even defined by some philosophers to be “unscientific,” to consider the application of this definition to the universe, this is exactly what recent evidence from science is suggesting. The universe appears to be finely tuned, or engineered in a machine-like fashion, for life.¹⁷ In other words, the motion and energy transmitted through the expansion associated with Big Bang cosmology has resulted in structures and mechanisms which are necessary for, and even conducive to, the emergence of complex life. The constants of physics, laws of nature, and initial conditions of the universe all appear to have been predetermined, or calculated, for the existence of life. Of course, there are other interpretations, such as the multiverse hypothesis,¹⁸ but this inherent ambiguity is consistent with a system that appears to have been engineered to engender trust, or faith in a Creator. Certainly, there are differences between this kind of cosmic engineering, which seems to be an ongoing process, and human engineering, but the evidence strongly suggests some kind of intentionality and intelligence behind the universe.

Furthermore, engineers who study the evidence for fine-tuning recognize an underlying ingenuity associated with the universe and life processes. Ingenuity is defined as “skill or cleverness in devising or combining,”¹⁹ and this is what is observed in natural systems. Life-friendly chemical elements are manufactured within stars and somehow ingeniously combine, eventually resulting in complex life. It is now obvious that mutation and natural selection play an important role in these processes, perhaps even to the extent of common ancestry. But where do the laws of physics and biology come from that allow such a symphony of life?²⁰ Physicist Walter Thirring, in his book, *Cosmic Impressions: Traces of God in the Laws of Nature*, writes, “Chemical forces are able to create the most astounding things out of atoms as if by magic. Life continues this process and takes it to the extreme.”²¹ A theistic worldview posits that such

ingenious and creative forces are the action (either directly or indirectly) of a master design engineer who “holds all things together.”²²

Engineering Professor Walter Bradley provides insight into the difference between cosmic and human engineering. Human engineering consists of specifying the boundary conditions under which the laws of nature operate to produce a purposeful outcome. Cosmic engineering must involve specification of not only the conditions under which the laws of nature operate, but the laws themselves and the universal constants that scale the “building blocks” of matter and energy and the fundamental forces in nature to provide the purposeful outcome of a habitable universe for life, and life itself. Dr. Bradley contends that for someone to choose to believe that there is a naturalistic explanation for the precise fine tuning of all of these factors is to “believe in a miracle by another name.”²³ The primary author of this paper has recently published a chapter on the applicability of state-of-the-art reverse engineering techniques and methodologies for answering some of the deeper questions associated with the origin of complex natural systems.²⁴ This includes the difficult and perennial problem of evil and suffering, especially in biological systems.²⁵ Actually, a reverse engineering approach readily addresses this problem by considering the possibility that the system of life has experienced damage or corruption during its history.²⁶ Again, a theistic worldview might suggest that this occurred when the system voluntarily strayed from its original purpose. It is common knowledge that engineered systems are susceptible to damage or corruption when used in unintended ways. Even so, a good engineer will foresee this possibility and perhaps plan for a redemptive solution that somehow draws good out of evil and suffering. It is believed that such a solution is provided by Christian theism, for example.

Another class of examples of ingenuity in nature involves the recognition of engineered solutions to problems in the natural world. Sometimes, natural solutions are discovered only after human inventors have already independently devised a strikingly similar solution. An example of this was published last year with the discovery and analysis of the plant hopper’s utilization of interlocking spur gears to synchronize leg motions during its explosive hop.²⁷ Spur gears have been used by human engineers for millennia, but it is thought that last year’s discovery was the first time that spur gears were found in nature. Of course, this solution is probably the result of environmental pressures involving mutation and natural selection, but one should take care not to miss the bigger point. Regardless of how these natural systems came to be, they exhibit fabulous engineering, in terms of efficiency and ingenuity, when compared to examples that human beings have to offer. The information storage capacity of the DNA molecule is another example of an ingeniously engineered solution in nature. The exploding field of engineered biomimicry testifies to the ingenuity that underlies the natural realm.²⁸ This ingenuity, and the fact that natural systems are so readily and profitably reverse engineered by humans, strongly suggests that such systems were engineered in the first place. The implication is that of a caring and calculating intentionality that resonates strongly with a theistic worldview in which humans are created in God’s image.

Results and Conclusions

Although the number of theists in America appears to have declined slightly in recent years, a Harris Poll administered at the end of 2013 found that “a strong majority (74 percent) of U.S.

adults say they believe in God.”²⁹ Perhaps one of the reasons for the decline is that religious institutions have neglected to clearly articulate the relation and relevance of religious faith to scientific and technological understandings, which underpin the more materialistic worldviews that pervade the further developed countries of the world. This project attempts to translate information from the academy to the church in order to help rectify this situation. In the process, it is believed that enthusiasm for engineering and science will increase among both adults and young people. Survey data indicates that demonstrating the underlying ingenuity behind nature, as exemplified above, has been moderately successful in accomplishing this goal.

Thus far, as a part of this grant-funded project, 45 presentations have been made to community groups, churches and Christian schools with a total audience of 1,579 people. A diverse selection of 14 of these groups was anonymously surveyed in an attempt to assess the impact of the presentations and drive improvements for the future. The presentations typically close with lively question and answer sessions between speaker(s) and audience. A total of 496 people completed and returned surveys at the end of the presentations. Of these respondents, when given the options on a 5-point Likert scale, 42% agreed, and 17% strongly agreed that the presentation had increased their enthusiasm for engineering or science. 30% were neutral on this issue, while 11% either disagreed or strongly disagreed. Even higher scores were received for the statement regarding ingenuity. 75% of respondents either agreed (48%) or strongly agreed (27%) that the presentation helped them appreciate the ingenuity that underlies the universe.

Of those who returned surveys, 261 people chose to include optional comments in response to the presentations. 50% of these comments were neutral but constructive, 45% were positive or appreciative, and only 5% were negative. More comprehensive results can be found in a paper presented at the Faith and Science Conference at Evangel University in Springfield, Missouri on June 24, 2014.³⁰ In addition, anecdotal evidence suggests that these kind of public presentations, which had been going on for several years before the awarding of the grant, may be partly responsible for the recent growth in engineering enrollment at ORU. This is evidenced by the fact that several current engineering students have offered personal appreciation to the primary author for such presentations, as influential in their decision to pursue a career in engineering.

Finally, this project has also had a significant impact on ORU undergraduate students who serve as members of the project research team. Most of these students are engineering majors, as well as members of the ORU Honors Program. As honors students, they enjoy a small amount of monetary compensation for their research efforts. Weekly meetings are held under the direction of the primary author during the academic year to present research findings and develop presentations and publications. Students often co-author publications, this paper being one example, and sometimes assist in making presentations. Over the last six years this group has produced hundreds of presentations, 19 conference papers, 5 journal articles, and 4 book chapters. In producing these publications, 21 different undergraduate students and 8 different faculty members served as co-authors. In 2012, current and previous students on the research team were surveyed. All respondents strongly agreed that participation in the group assisted them in communicating on issues of science and faith. In addition, all respondents agreed that participation assisted them in solidifying personal integrity (wholeness), and resulted in a greater sense, and understanding, of personal purpose.

More details on the work of this research group and further results of the survey can be found in a paper presented at the Spirituality and Honors Education Symposium at Indiana Wesleyan University on May 29-31, 2012.³¹ The work of this group appears to be meeting an important need by helping those with a theistic worldview to reconcile science and religious faith. As described above, concepts from engineering have an important role to play in this regard, and as a result, both young and old alike are experiencing a newfound appreciation and enthusiasm for the field of engineering.

References

1. Richard Dawkins, *The God Delusion*, Bantam, London, 2006.
2. Richard Dawkins, *The Magic of Reality: How We Know What's Really True*, Bantam, London, 2012.
3. Alvin Plantinga, *Where the Conflict Really Lies: Science, Religion, and Naturalism*, Oxford University Press, New York, 2011.
4. Alistair E. McGrath, *Science and Religion: A New Introduction*, Wiley-Blackwell, West Sussex, UK, 2009.
5. David Kinnaman, *You Lost Me: Why Young Christians are Leaving Church...and Rethinking Faith*, Baker, Grand Rapids, MI, 2011.
6. Kinnaman, p. 140.
7. Kinnaman, p. 137.
8. Baruch A. Shalev, *100 Years of Nobel Prizes*, Atlantic Publishers & Distributors, p.57, 2003: between 1901 and 2000 reveals that 654 Laureates belong to 28 different religions. Most (65.4%) have identified Christianity in its various forms as their religious preference.
9. <http://biologos.org/>. This paper and presentation were made possible through the support of a grant from the BioLogos Foundation's Evolution and Christian Faith program. The opinions expressed are those of the authors and do not necessarily reflect the views of BioLogos.
10. Dominic Halsmer, Jon Marc Asper, Nate Roman and Tyler Todd, "The Coherence of an Engineered World," *international Journal of Design & Nature and Ecodynamics*, Vol. 4, No. 1, pp. 47-65, 2009.
11. Dominic Halsmer, Jessica Fitzgerald, P. Wesley Odom and Taylor Tryon, "Implementation and Assessment of a Curricular Module on the History and Philosophy of Reverse Engineering in Biological Systems," *Proceedings of the ASEE Annual Conference*, Atlanta, GA, June 24-26, 2013.
12. Dominic Halsmer, Nate Roman and Tyler Todd, "Integrating the Concept of Affordance into Function-based Reverse Engineering with Application to Complex Natural Systems," *Proceedings of the ASEE Annual Conference*, Austin, TX, June 14-17, 2009.
13. Dominic Halsmer, Nicholas Halsmer, Robert Johnson and James Wanjiku, "The Applicability of Engineering Design Principles in Formulating a Coherent Cosmology and Worldview," *Proceedings of the ASEE Annual Conference*, Pittsburgh, PA, June 22-25, 2008.
14. Dominic Halsmer, "Application of the 'Engineering Mindset' for Worldview Evaluation," *Proceedings of the ASEE Midwest Section Annual Meeting*, Tulsa, OK, Sept. 19, 2008.
15. Dominic Halsmer, Elliot Butay, Ben Hase, Sean McDonough, Taylor Tryon and Joshua Weed, "Exploring Connections between Engineering and Human Spirituality," *Proceedings of the ASEE Annual Conference*, Louisville, KY, June 20-23, 2010.
16. Robert L. Norton, *Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines*, 5th edition, McGraw-Hill, New York, p. 4, 2012.
17. Alistair E. McGrath, *A Fine-Tuned Universe: The Quest for God in Science and Theology*, Westminster John Knox, Louisville, KY, 2009.
18. Leonard Susskind, *The Cosmic Landscape: String Theory and the Illusion of Intelligent Design*, Time Warner, New York, 2006.
19. *Webster's Ninth New Collegiate Dictionary*, ed. Frederick C. Mish, Merriam-Webster, Springfield, MA, p. 621, 1984.
20. Arthur Peacocke and Ann Pederson, *The Music of Creation*, Fortress, Minneapolis, MN, 2006.
21. Walter Thirring, *Cosmic Impressions: Traces of God in the Laws of Nature*, Templeton Foundation, West Conshohocken, PA, p. 129, 2007.
22. *Holy Bible*, Colossians 1:17.

23. Walter L. Bradley, "The 'Just So' Universe: The Fine-Tuning of Constants and Conditions in the Cosmos" in *Signs of Intelligence: Understanding Intelligent Design*, ed. William A. Dembski and James M. Kushiner, Baker, Grand Rapids, MI, pp. 157-170, 2001.
24. Dominic Halsmer, Michael Gewecke, Rachelle Gewecke, Nate Roman, Tyler Todd, and Jessica Fitzgerald, "Reversible Universe: Implications of Affordance-based Reverse Engineering of Complex Natural Systems," in *Engineering and the Ultimate: An Interdisciplinary Investigation of Order and Design in Nature and Craft*, ed. Jonathan Bartlett, Dominic Halsmer and Mark R. Hall, Blyth Institute Press, Broken Arrow, Oklahoma, pp. 23-50, 2014.
25. John C. Avise, *Inside the Human Genome: The Case for Non-Intelligent Design*, Oxford University Press, New York, 2010.
26. Dominic Halsmer, Ken Weed and Taylor Tryon, "Introducing the Possibility of Corruption to Facilitate Reverse Engineering of Natural Systems," Annual Meeting of the American Scientific Affiliation, Point Loma Nazarene University, July 20-23, 2012.
27. Malcolm Burrows and Gregory Sutton, "Interacting Gears Synchronize Propulsive Leg Movements in a Jumping Insect," *Science*, Vol. 341, no. 6151, pp. 1254-1256, September 13, 2013.
28. *Engineered Biomimicry*, ed. Akhlesh Lakhtakia and Raul J. Martin-Palma, Elsevier, Waltham, MA, 2013.
29. Susan Jones, "Poll: Americans' Belief in God Is Strong – But Declining," <http://cnsnews.com/news/article/susan-jones/poll-americans-belief-god-strong-declining>, December 17, 2013.
30. Dominic Halsmer and Caleb Lutz, "Science and the Wisdom of God: Encouraging an Appreciation for the Ingenuity that Underlies Our Evolving Universe," in *Genesis and Genetics: Proceedings of the 2014 Faith and Science Conference*, ed. David R. Bundrick and Steve Badger, Logion Press, Springfield, MO, 2014.
31. Dominic Halsmer and Joshua Beck, "Encouraging Spiritual Vitality through Multidisciplinary Discussions on the Role of Engineering in Reconciling Science and Faith Issues," Spirituality and Honors Education Symposium, Indiana Wesleyan University, May 29-31, 2012.

Biographical Information

DOMINIC HALSMER

Dominic Halsmer is former Dean of the College of Science and Engineering at Oral Roberts University where he has been teaching engineering for 22 years. He currently serves as Director of the ORU Center for Faith and Learning. He received BS and MS Degrees in Aeronautical and Astronautical Engineering from Purdue University, and a PhD in Mechanical Engineering from UCLA in 1992. His current research interests include contributions from the field of engineering to the current science/theology dialogue and the reverse engineering of complex natural systems.

PETER WESLEY ODOM

Wesley Odom is an undergraduate Honors Student in Engineering Physics at Oral Roberts University. He also heads up the ORU Chapter of the American Scientific Affiliation and serves as National Secretary and Treasurer of the ASEE Student Division.