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Theology and Engineering Practice: Models of Reality

William Jordan*

Abstract

To a Christian engineer both faith and engineering practice are very important. As we work through what we believe about God and how we practice engineering, we find that they have something important in common. Both systematic theology and engineering practice are human models created in our attempts to understand reality.

When theologians attempt to systematize the faith, they are coming up with human models of how they see God acting in human history. When engineers design new products, they use models of how materials act when they have various forces applied to them.

For example, in discussing end times theologians have created models such as pre-millennial, post-millennial and a-millennial. Similarly, as an engineer I accept the model of Newtonian mechanics to describe the behavior of solid materials under stress. However, this is just a model (though a good one) of how things behave.

While these models are human abstractions concerning ultimate reality, they need to be precise enough upon which to base fundamental choices in life. If we are to experience the life God wants us to have we need to understand theology well enough to know what God expects of humans. While Newtonian mechanics is not a perfect model it is good enough for us to use as the basis for the design of a new airplane. In both situations, human life is at stake. Good theology can help us understand God better; good engineering can make human life more comfortable and help us understand science better.

With respect to innovations, both disciplines recognize their need, but also their limitations. Whatever we develop must match the reality that we already know. A good theologian needs to be able to help Christians who face new issues, such as privacy and the use of technology. However, too much innovation in theology can lead to models about God that are consistent with neither the Bible nor the experiences of Christians throughout history. Engineers are rewarded for creating new designs; however, whatever they create must still work in the real world. Their designs have to be grounded in the real physical world that exists.

Systematic theology and engineering practice are models of reality, not ultimate reality itself. However, they can become good enough models so that you can reliably use them to guide your life. This paper describes several ways that such models can be used by the Christian engineer.

Introduction

Christian engineers live in two worlds. During the week they live in the world of high technology and much of it appears unrelated to their spiritual lives. Many of their secular

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colleagues do not understand their perspectives, and may even belittle them. When they go to church they are in another world where spiritual topics predominate, and many of their church friends do not understand their love of technology and of solving technical problems. It is easy for the Christian engineer to assume that these two worlds never relate to each other. The purpose of this paper is to show some of the similarities between engineering and faith by examining how both engineers and theologians develop and use models to help understand their worlds. If our Christian faith is real, it must relate in some way to our engineering practice.

Every Christian believer should be called into her respective profession. This includes Christian engineers. Os Guinness writes (Guinness):

Calling is the truth that God calls us to himself so decisively that everything we are, everything we do, and everything we have is invested with a special devotion, dynamism, and direction lived out as a response to his summons and service.

For an engineer this calling is to practice engineering. It does not matter whether the Christian engineer is working for a secular company or a Christian ministry, the engineer is still called to practice engineering. Engineers have a great opportunity to use their skills to better the society around them. Within the context of engineers, Newberry has written (Newberry) that this call is a

divine call or summons to live a life of transcendent purpose-to use one's distinct gifts in the service of God's people and for the stewardship of God's creation.

For a Christian engineer it is important to learn what the Bible does or does not say about engineering. What follows is a Christian perspective on engineering, not *the* Christian perspective on engineering.

Science based engineering as exists today did not exist in Biblical times. Builders learned from experience what worked and what did not work. Even in ancient times governments recognized the difference between competent and incompetent engineering. One fracture mechanics textbook by Hertzberg reports on an old way to ensure high quality bridge designs (Hertzberg). Whenever a new bridge was built the designer of the bridge had to stand under it while a team of chariots rode over it. This helped to ensure high quality designs as well as high quality in the construction.

There is therefore a need to infer a Biblical perspective on engineering based on what the Bible says about things such as building. The author has discussed some aspects of this in two earlier conference papers (Jordan [2008], Jordan [2013]). Building things is praised in the Bible. An example of this is in the building of the ark of the covenant. It is written in Exodus 31:1-7:

Then the LORD said to Moses, ² "See, I have chosen Bezalel son of Uri, the son of Hur, of the tribe of Judah, ³ and I have filled him with the Spirit of God, with skill, ability and knowledge in all kinds of crafts— ⁴ to make artistic designs for work in gold, silver and bronze, ⁵ to cut and set stones, to work in wood, and to engage in all kinds of craftsmanship. ⁶ Moreover, I have appointed Oholiab son of Ahisamach, of the tribe of Dan, to help him. Also I have given skill to all the craftsmen to make everything I have commanded you: ⁷ the Tent of Meeting, the ark of the Testimony with the atonement cover on it, and all the other furnishings of the tent.

It appears from this Exodus passage that the interest and skill in doing this work were gifts from God. Similarly, our interest in engineering, and our ability to solve engineering problems are gifts from God. This does not mean that hard work is not required for us to be able to use our skills to their fullest potential. The competent practice of engineering is hard work. However, we do need to recognize that our engineering interests and abilities come from God.

While God commends building and creating, engineers need to recognize that what they build is not going to last forever. This is pointed out in Ecclesiastes 2:4, 6, 10-11, where the teacher states:

⁴I undertook great projects: I built houses for myself and planted vineyards... ⁶I made reservoirs to water groves of flourishing trees.

*¹¹Yet when I surveyed all that my hands had done
and what I had toiled to achieve,
everything was meaningless, a chasing after the wind;
nothing was gained under the sun.*

Fortunately the above quotation is not a final statement about building. However, it makes the point, that if engineers only care about the things they create, they will inevitably be disappointed. This does not mean that building great structures is bad, only that this cannot completely satisfy your life. Engineers do not have unlimited time, so they need to be wise in how they choose to use it.

The Nature of Engineering

While there have been many attempts to describe the scientific method, there has been much less work done with respect to engineering. We are indebted to the excellent work done by Billy Koen from the University of Texas. Koen writes (Koen):

By the engineering method I mean the strategy for causing the best change in a poorly understood or uncertain situation within the available resources and the use of heuristics.

This is a very broad definition of engineering. One major point is that engineering attempts to provide the best possible solution to a problem, not a perfect solution. There is always some uncertainty with respect to any engineering design. Another major point is that engineers cause change. They are not just pursuing scientific truth for the sake of truth. They want to do something to make some situation better.

It is important to understand what Koen means by heuristics. A heuristic is something that provides a plausible aid to the solution of a problem, but which cannot be proved. Some examples of heuristics that engineers might use are:

- Rules of thumb, such as always use a safety factor of at least 2
- Make small changes in the state-of-the-art
- At some point in the project, freeze the design

At the heart of engineering practice is engineering design. Engineers design new things to solve real world problems. However, when engineers do design they need to recognize that there are

potentially multiple good solutions to the problem. Brad Kallenberg makes an important point about this. He writes (Kallenberg)

There is no single, correct design. There may be entirely wrong designs. But within the range of roughly acceptable solutions to a design problem, each proposed solution must be evaluated for its relative satisfactoriness.

The real world is messy. As wonderful and powerful as mathematics and the hard sciences are, they do not perfectly describe the actual world we live in.

Kallenberg recognizes that a discussion of engineering heuristics, such as has been done by Billy Koen may seem overly philosophical to many practicing engineers.

One might object that all this blather about heuristics doesn't sound like it makes anything clearer. To this I can only say that if the water is muddy, it only makes things worse to report it is clear. Dealing with murky problems is what engineering is all about.

Kallenberg's quote reinforced the point Koen made that much of engineering practice involves the best change in a poorly understood situation. The practice of engineering is clearly a process that involves making models of reality. The better the model, the better the design can become.

The Nature of Theology

For a Christian engineer who seeks to do justice to both faith and profession, figuring out theological details can be very confusing. What is good to know is that the most basic theological needs are not complicated.

The prophet Micah writes:

*He has showed you, O man, what is good.
And what does the Lord require of you?
To act justly and to love mercy
And to walk humbly with your God*

The apostle John makes the point that we need to know Jesus as our savior. He writes in 1 John 5:

Everyone who believes that Jesus is the Christ is born of God, and everyone who loves the father loves his child as well. This is how we know that we love the children of God: by loving God and carrying out his commands. This is love for God: to obey his commands. And his commands are not burdensome.

If the basics of the faith are not complicated it is a fair question to ask: Why should a Christian do a systematic study of theology? A good answer to this has been provided by John Calvin, who may be the first great systematic theologian of the Protestant Reformation. Calvin writes in the introduction to his famous Institutes of the Christian Religion (Calvin):

Although the Holy Scriptures contain a perfect doctrine, to which nothing can be added—our Lord having been pleased therein to unfold the infinite treasures of his wisdom—still every person, not intimately acquainted with them stands in need of some guidance and direction as to what he ought to look for in them, that he might not wander up and down, but pursue a certain path, and so attain the end which the Holy Spirit invites him.

Calvin's point is that good theology can help the earnest Christian learn more about what God wants him to do. This good theology is not just a theoretical construct, but should be practical. Writing in the early 20th century, theologian August Strong writes (Strong):

I make no apology for the homiletical element in my book. To be either true or useful, theology must be a passion... Theology is a science which can be successfully cultivated only in connection with its practical application.

Strong emphasizes that the study of theology is important because it is very practical. The more people know, they better they are able to understand what God wants them to do to live the Christian life.

While the fundamentals of the faith are not complicated, there is no way humans can fully understand all there is to know about God. Theologians use models to describe their interpretations of it. Even among evangelicals there are different models of the end times (pre-millennial, amillennial, post-millennial) and baptism (believer's baptism vs. infant baptism).

It is easy to find articles about Bible illiteracy in the church (Christianity Today). This article says that of those who attend church every week in the United States, only about 45% read the Bible as much as once per week. The article goes on to say:

Because we don't read God's Word, it follows that we don't know it. But it's more than simply not knowing stories from Scripture. Our lack of biblical literacy has led to a lack of biblical doctrine.

From articles like the one cited above, it is fair to say that many in the American church do not really understand much about their faith. This applies to Christian engineers as well. Their model of how God works in the world may be rather weak. It is hard to obey God if you do not know the details of how God wants us to live on a daily basis.

Relating Engineering Models and Theological Models

There has not been a lot written about integrating faith with engineering practice. Two excellent books that deal with this in some fashion are those by Monsma and Hardy. Hardy relates vocation to work (Hardy):

An initial attempt to formulate the principles of vocational choice was made by the Protestant reformers of the sixteenth and seventeenth centuries. They were...firmly convinced that all of life, even the life of everyday work, ought to be lived to the glory of God....The second step in vocational decision-making is locating the place where our native abilities and acquired skills can be put at the disposal of those who need them.

In developing a basic theology of technology a good starting point might begin with answering the question: What does God want engineers to do? One starting point could be that God wants Christian engineers to use their skills to help others. Jesus speaks in Luke 12:48:

From everyone who has been given much, much will be demanded; and from the one who has been entrusted with much, much more will be asked.

Engineers have been given great talents by God, and God expects us to use them to help others. This using of our skills to help others is very consistent with engineering codes of conduct. For example, the ASME code's very first Fundamental Canon states (ASME)

Engineers shall hold paramount the safety, health, and welfare of the public in performance of their duties.

This statement shows ASME believes promoting human flourishing is at the heart of engineering practice. This is very consistent with a Biblical perspective.

There is a need for the church to understand how to relate their faith to the high technology world around them. A book that provides some real insight into this is by Jack Swearingen (Swearingen). He writes:

All technologies have consequences that were not part of the original intent and are usually not anticipated.

These unintended consequences may have great impact on how we practice our Christian faith.

An example of this is seen in events at the start of the Protestant Reformation. There was a rapid response to Martin Luther's posting of his 95 Theses on the Wittenberg Castle Church door on October 31, 1517. Luther was not the first reformer; there had been others in the preceding 200 years. However, it was his acts that triggered a revolution in Western society. There are many reasons for this, but a crucial component of this was something that had happened about 60 years earlier and only 250 miles away in Mainz.

In the 1450's Johannes Gutenberg developed the first practical movable type printing press. This development has been proclaimed by many as the invention of the millennium. He combined two things that had already been created, the wine press and a coin punch. The result changed the world. Gutenberg's press allowed Luther and the other reformers to spread their message much more quickly than could ever have been done before. Pamphlets could be rapidly printed and spread throughout Europe.

The printing press made several changes that were extremely helpful for the reformers:

- The Bible could be printed much more cheaply than ever before.
- Since most people were still illiterate, small, inexpensive pamphlets could be rapidly written, printed, and distributed. They could be read to the people in market squares all over Europe.
- The creation of these pamphlets could be done anywhere someone could get access to a printing press. This ended forever the monopoly the church and the various royal houses had on written communication. It helped bring in an era of individualism which is still with us.

Technology historian Steven Johnson makes a similar point when he writes (Johnson):

Innovations usually begin life with an attempt to solve a specific problem, but once they get into circulation, they end up triggering other changes that would have been extremely difficult to predict....An innovation, or cluster of innovations, in one field ends up triggering changes that seem to belong to a different domain altogether.

It is not likely that Gutenberg's goal was to create revolutions in both the religious and political order of Europe. However, that is indeed what his invention helped to ignite.

One of the problems we face is that many Christians do not base their life on the Bible. In his book about technology Swearingen makes the following important point (Swearingen):

The Church needs a crash course in technology and culture... To grow as disciples of Jesus Christ we must discern how much our lifestyle, values, and worldviews are shaped by non-biblical influences.

Swearingen then makes the point that the church needs to use Biblical values to confront the scientific-technological worldview. He says we need to create a theology of technology.

Our knowledge of the physical world is limited. We do not know everything that would be desirable to know about it. Scientists and engineers have created models to help them understand the world and create new things, such as modern technology. For example, while Newtonian mechanics has its limits it is good enough for us to use in many things.

In a similar way we can never know everything there is about God. However, we know enough to come to know Him personally and be assured of eternal life. As we study more of the Bible we can learn more about how He wants us to live our life. As our personal experiential models about God get better, we can know better and obey Him more consistently.

Some Christian engineers may be troubled over the fact that they do not know everything about God. However, we implicitly trust our models about the physical world, even though we know the world imperfectly. Our imperfect knowledge about it is good enough for us to create many wonderful technologies that help make life better for many people. Our knowledge of God, while not complete, is based on a standard that is trustworthy (the Bible).

Conclusion

Both engineers and theologians create models about the world. None of these models is a perfect representation of reality. However, they are good enough to base our professions and our life upon them.

An important question is when do we know our models of engineering and theology are good enough? With respect to engineering models the question is whether or not they reasonably represent what is observed in the real world. We need to recognize that we frequently simplify what appears to be happening in order to more easily model it. We therefore should not expect absolute correlation of our engineering models with reality. They need to be precise enough for us to use in a practical way.

With respect to theological models, we recognize that we will need to create new models to deal with new issues. For example, it is only recently that people have begun thinking about a theology of appropriate use of the internet. However, with respect to our theological models we have two things we can use as a standard to compare our models against. The first one is the Bible. Is our new model consistent with what the Bible teaches? If it is not, then it is a bad model and should not be pursued.

A second thing we can use to guide us is the work of previous Christians throughout church history. While this is not the absolute standard that the Bible is, it can give us guidance. For example as we more fully develop a theology of technology we may not have a lot of direct guidance from history. However, what other Christians have written about the nature of work and the nature of vocation can be very relevant to our work.

In summary, Christian engineers work with models both in their professional lives and in their lives of faith. In both cases the models are not perfect. However, they are precise enough upon which to base your life.

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