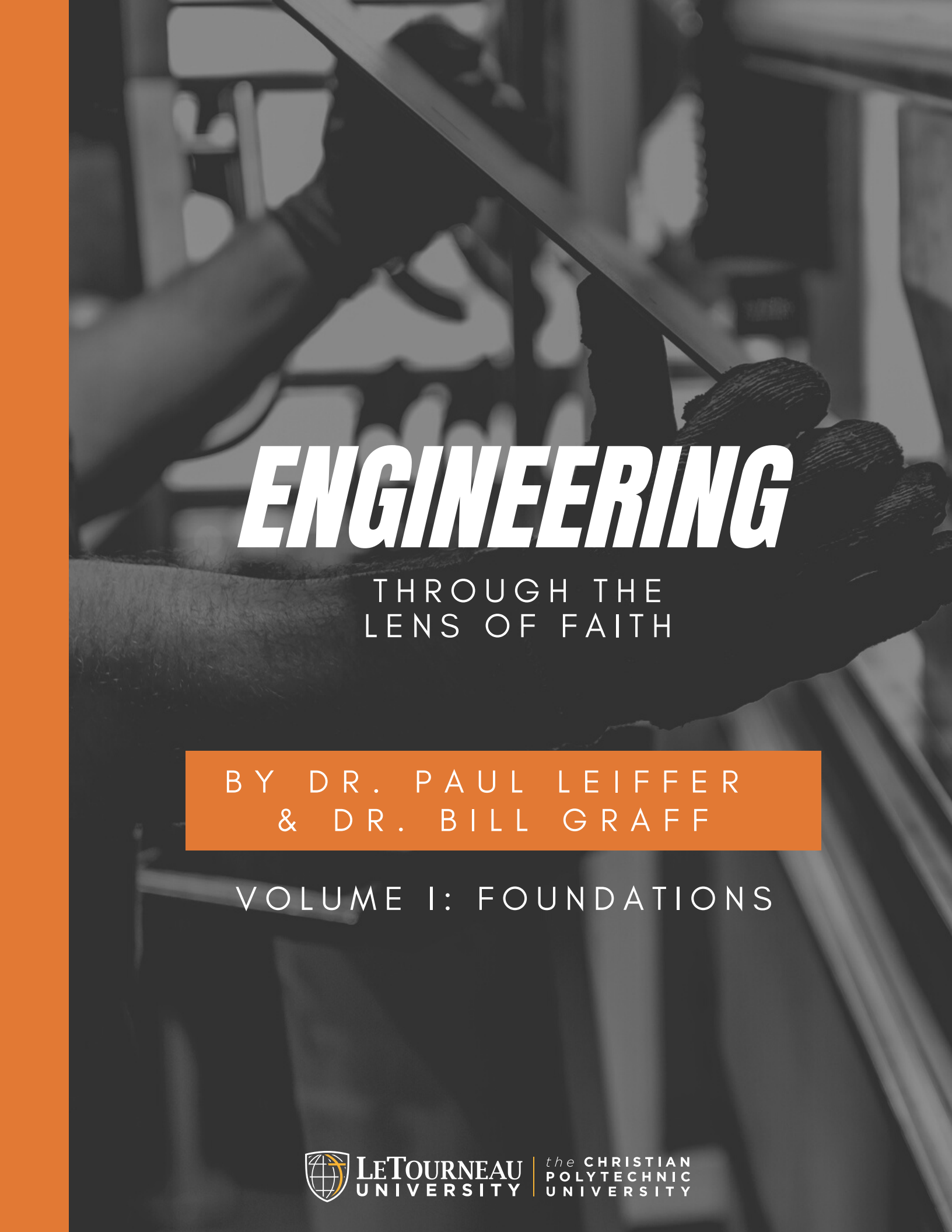

ENGINEERING

THROUGH THE LENS OF FAITH

BY DR. PAUL LEIFFER
& DR. BILL GRAFF

VOLUME I: FOUNDATIONS

LeTourneau University | the Christian Polytechnic University

ENGINEERING THROUGH THE LENS OF FAITH

VOLUME 1: FOUNDATIONS

By Dr. Paul Leiffer
& Dr. Bill Graff

Professors Emeriti at
LeTourneau University

DEDICATED TO

Walter Bradley,
Lambert Van Poolen,
Bill Jordan, and
Steve VanderLeest,

Four outstanding engineering educators who were pioneers in describing what Christians in engineering should look like.

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OVERVIEW OF VOLUMES I & II

PREFACE

Most of the material presented here was originally developed by the authors in the form of short papers and class devotionals. Because many of the pieces may seem familiar to former students we have differentiated these ("By Paul" or "By Bill") in the text. Some material derives from conference papers in which we were co-authors. Other material was prepared specifically for this volume.

The authors are grateful to our wives for reading the manuscript, to Howard Henry and Norm Reese for editing and formatting help, to alumni reviewers, and to Daniel Ostendorff for spearheading publication in book form. Our hope is that this book will strengthen engineers who love Jesus and will generate ongoing discussion of the issues raised herein.

CHAPTER 1: INTRODUCTION

BACKGROUND

At various times I (Paul) have had occasion to explain to relatives and new acquaintances that I teach engineering at a Christian college where we stress the intersection of faith and the discipline taught. Their reaction is typically one of puzzlement: What does the ethereal world of faith have to do with the real-world nuts-and-bolts, equations and measurements of engineering practice? As a high school student I would have raised the same question, but having been in this profession for four decades and learned from many who have wrestled with this issue I am convinced that an understanding of this intersection is vital for any believer who works in engineering. In the chapters that follow Bill Graff and I will focus on three smaller questions that frame the issue: (1) How has engineering shaped my view of God? (2) How does engineering contribute to God's plan of redemption and to human flourishing or fulfillment? (3) How can we love God and our neighbor through the practice of engineering?

WHY THIS BOOK?

In the 1970's two books explored the intersection of Christian faith and various academic disciplines, Christianity and the World of Thought [1] and The Christian Mind [2]. Interestingly, both books addressed psychology, the humanities, mathematics, and natural sciences, but neither book touched at all on the field of engineering. During the 1990's, Harper Collins issued a series of books with titles (Business, Biology, History…) Through the Eyes of Faith. Again, engineering was missing from the collection.

This is not to suggest that engineers have been silent about exploring the intersection of faith with their discipline. A strong foundation in Christian engineering has been established and is searchable. Since the 1980's various engineering faculty have presented papers at national meetings where their contribution included aspects of their faith-based worldview. [3], [4], [5] Also, a series of journal articles and book chapters by Christian faculty have been published on the topic. [6], [7], [8] Beginning in 1992, engineering faculty and professionals have met together every 2-3 years for the Christian Engineering Conference. The intersection of faith and engineering practice, primarily from the point of view of education, is a common theme at this conference, and most of the proceedings are available. [9] To date, however, we have not seen a compiled book addressing the issues of engineering and faith.

PAUL'S STORY

When I began my studies in electrical engineering (EE) at SUNY Buffalo, I was a young believer in Christ who had seen several positive role models, but had minimum knowledge of theology. I did realize that, somehow, God had given me some skills in math and science and a desire to learn how things work. I learned that engineering is directed technical problem-solving, defined as "the practical application of mathematics and science to the benefit of mankind." My first encounter with philosophy was a disaster. The professor taunted Christians like Goliath taunted David and the Israelites, and I didn't know where to begin to counter his arguments.

About this time, I located the campus chapter of Intervarsity Christian Fellowship, a few dozen students serious about living out their faith. I was challenged to study the book of Romans and to develop a daily "quiet time" of Bible reading and prayer. Some of the students also mentioned helpful material by Francis Schaeffer, an American pastor living in Switzerland who was concerned about providing real answers to real questions. Throughout all my academic preparation my knowledge of God was growing in parallel with my knowledge of engineering science, but I still saw little connection between the two.

As I was approaching my senior year, I wondered what direction to pursue for employment. Most engineering jobs at the time were along the lines of designing televisions or making missiles, neither of which appealed to me. When I expressed this concern to a friend, he arranged for the dean to introduce me to Wilson Greatbatch, an electrical engineer and inventor of the cardiac pacemaker. Wilson Greatbatch offered me the opportunity to work for his company for the summer. As a result of this internship, I applied to graduate school to study biomedical engineering, an area I was sure could benefit mankind.

While in grad school at Drexel University I was required to study anatomy and physiology, where I learned about the complex design of the human body. I soon met a member of the EE faculty that several students had mentioned, Dr. Bill Graff. Bill taught a course open freely to the public that he called "Engineering Theology," an introduction to Christian basics and apologetics explained in terms familiar to engineers. During my time at Drexel I interacted often with Bill Graff, who challenged my shallow thinking and got me to ask questions and think about the following:

- What really is faith? Is it really just a blind leap in the dark?
- Is there actually a wall between the sacred and the secular, a "two-pot system" for life, or is God the God of all parts of life?
- What does vocation or "calling" mean? Is engineering a legitimate "calling" from God, just as pastoral ministry is a "calling" from God?

After college I was accepted for a postdoctoral research project (working with physiology faculty studying the mechanical properties of single isolated heart cells) at the University of Kansas Medical Center. When the project concluded I accepted a faculty position in engineering at LeTourneau University (then known as LeTourneau College) in Longview, Texas.

LeTourneau University was founded by inventor-industrialist R. G. LeTourneau, a Christian businessman. He originally began the school as a training institute for the machinists and welders employed in his plant. I also had the opportunity to teach and to collaborate with Bill Graff, who was on the faculty there (and who had invited me to apply).

BILL'S STORY

I grew up in the Midwest and was raised as a Deist. My dad didn't believe that any God was operating in the world, but he did believe in hard work and morality. I had morals and Christian words but no real Christian base.

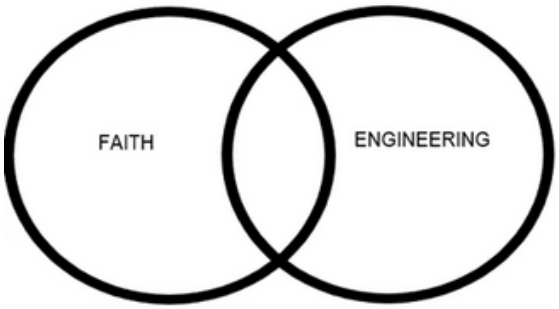
In high school in Springfield, Missouri, I hung around with a guy named Steve Garlock who was a ham radio operator. Garlock understood inductors and capacitors and liked to impress us. I'd go over to his house, and we'd talk about radio, telepathy, telekinesis and flying saucers. (I was also heavy into science fiction and thought most of sci-fi was possible.) Eventually I realized how scary it could be to have all that sci-fi power. (You might dream that you were tossing lightning bolts around and wake up to find the house burned down.) I finally decided that anti-gravity was the thing I could invent, and, needing a lot more education, I went off to study electrical engineering at Purdue.

I started going to a church while on a summer job in Long Island - not to find God, but to meet girls. The upshot was, I heard the Gospel and encountered God and met the young lady who later became my wife. That summer changed my life forever. I met a girl and I met God.

I went through bachelor's degree, master's degree, and Ph.D. at Purdue, specializing in electromagnetic fields. After teaching at Drexel University (Philadelphia) and Wilkes College (Wilkes-Barre, Pa.) I joined the faculty at LeTourneau University, where I taught for 43 years until retirement.

ENGINEERING & FAITH

How do spiritual faith and the physical transformation of the earth begin to intersect? Let's look at five critical questions, which will form the framework for the upcoming chapters:



- What does it mean to be a Christian? How do I understand "salvation" from an engineering mindset?
- Where does it all (the tools and materials to engineer) come from? What is the source of the material world, the physical laws and my ability to work with it?
- How does my engineering work become a response to what God has done? How does it relate to questions of meaning and purpose?

- How do I handle it? How do I relate to issues of ethics, serving God, and loving my neighbor?
- What should I do with it? What projects are worth doing? How do I address design, technology, poverty and warfare?

ENGINEERING HELPS SHAPE MY VIEW OF GOD (BY PAUL)

As an engineer I have come to appreciate these things about our God (which will be fleshed out in the upcoming chapters)

1. God engineered a very complex world, even more complex than I had first imagined.

The universe is both more complex and stranger than I had thought. Our Creator is far more complicated than I had imagined. Black holes, bosons and quantum electrodynamics are now part of our description of the universe at the largest and smallest dimensions. If an electron can exhibit the properties of both a particle and a wave, I shouldn't be surprised that Jesus Christ could live on earth as both God and man.

2. God reveals Himself through "two books"- nature and Scripture.

Augustine developed the concept that God's revelation is two-fold. Nature reveals God's creative aspects but cannot communicate His plan for salvation. The Scriptures reveal God's character and plan but speak little of how the earth works. Both deserve our study and attention. If understood properly, the two will complement and not contradict each other.

3. God specifically made all things and continually sustains all things.

In the first chapter of Colossians we read that all things exist for Him. (Col. 1:15-17) This creation and ownership is the ultimate foundation of our profession. Not only do we practice engineering for the benefit of mankind, but first, consciously and deliberately, "for the glory of God".

4. It is not simply the existence of the natural world that points to a Creator, but the detailed design of the natural world that points to a Creator-Designer.

All of mathematics and physical principles were built into the universe and simply discovered by mankind.

5. God controls the world in a complex way.

God knows the position of every atom at every instant and takes pleasure in His engineered creation. God engineers the ultimate outcomes of human events even in the midst of our choices. While human designs are faulty, God's designs never fail.

6. Engineering makes use of the physical laws and resources built into the Creation to devise new things.

In doing design, engineers are using God-given skills to imitate what God has done. Genesis suggests that God specifically planned the design of the cosmos, and, after causing the sudden and initial appearance of space and matter, carried out its development in a systematic way (Genesis 1, 2).We are both constrained by and guided in our engineering by the physical laws. These laws and all raw materials may be considered gifts to mankind from God.

7. While God cares supremely about my soul He also cares about computers, airplanes, and my occupation.

While no part of existence is outside of God's control, He is the creator of the entire physical world and interested in everything that affects my life, benefits my life and captures my attention. If there were an actual sacred-secular division, then (1) secular work would be strictly second-best, (2) work would only be valuable as a means to earn money for spiritual efforts, (3) there would be little incentive to do excellent work in the "secular" realm and (4) six days of the week would be nearly wasted, and only Sunday would be valuable. On the other hand, if all can be done for God's glory, then all of life becomes sacred, including (engineering) work.

8. God's love is shown in the cross and also in "common grace".

Throughout all creation, God demonstrates His "common grace"- aspects of God's goodness available to all people regardless of their relationship to Him. This is seen in (1) the presence of the sun, moon and stars as a declaration of God's creation to all who look up (Ps. 19), (2) the sun, rain, soil and plants provided to all for growing food and (3) the human ability to make tools to work with nature. In all human creatures there resides creativity, resourcefulness and the capacity to make choices. In this way engineering may be seen as an area of common grace.

9. God actually commanded us to use and modify the natural world.

In Gen. 1:28 God gives to Adam, and thus to mankind, the earliest command of Scripture: to multiply the human race and to subdue the earth, to "have dominion" over the earth. In essence, Adam was told to "do engineering." Animals, plants and minerals all fall under this directive.

God is saying, in part, "Go forth and be engineers. Take the stuff of earth and use it to meet your needs and better your lives." In using the earth, Adam and all of the patriarchs knew clearly that God Himself had made everything and that they didn't own it. We have been placed here as stewards of the King's realm. The farther we move from this understanding, the more likely we are to destroy the natural world rather than using it responsibly.

Technology and stewardship fit together in God's "Dominion Mandate":

Obedience to the Dominion Mandate also requires the concordant development of physical and biological technologies (engineering, agriculture, medicine, etc.). These activities under the stewardship of the Dominion Mandate imply the complementary enterprises known by the modern terms of science and technology, research and development, theory and practice, etc. Technology, development, and practice suggest the application and utilization of the physical and biological processes and systems, as learned from their scientific study, for the benefit of mankind and the glory of God. [10]

Under the dominion mandate, suggest Rae and Scott, people were given the right to "unlock earth's resources for their benefit and the benefit of their successors."[11] Two Biblical themes keep our use of the earth in balance, dominion and stewardship. While the earth is ours to use, it is not ours to own. We are charged with managing it well.

CONCLUSIONS

"What has Athens to do with Jerusalem?" was a question posed to some of the early church fathers when they looked for an intersection between philosophy and Christian theology. "What has engineering to do with faith?" is a question for our day, and we've begun to see the framework of an answer.

Initially, we will make the following observations:

- If we begin with God as Creator, engineering leads to a greater appreciation for God's Creation.
- God's plan of redemption includes but is larger than my eternal destiny.
- Engineering has a place in restoring part of a fallen world.
- Loving our neighbor leads directly to the area of engineering ethics and to the consideration of the impacts of the technologies that we create.

This book is the culmination of fifty years of questions and some of the conclusions we've reached. Hopefully some of it will be helpful to you.

In the next two chapters we'll look at some working definitions for both "engineering" and "faith," which may be surprising and will move us forward in our thinking.

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CHAPTER 2: ENGINEERING

INTRODUCTION

If we were to poll people about what an engineer is or what kind of work engineers do, we typically get these kinds of responses:

- "Engineers are people who do engineering work." (That helps a lot.)
- "Engineers work in little cubicles and crunch numbers on computers."
- "Engineers used to recognizable by white shirts, white socks, pen protectors, and slide rules."
- "Engineers design bridges and machines." (Some do.)

In this chapter we'll take a brief look at the nature and history of engineering, some of its achievements, and recent thoughts on the philosophy of engineering.

WHAT IS ENGINEERING?

As a student in an Engineering program I (Paul) was taught this definition of engineering: "Engineering is the practical application of science and mathematics to the benefit of mankind."
Note the key concepts embedded in this definition.

- Engineering is practical. There will be practical results from engineering efforts.
- Engineering is application oriented. Unlike applied science which may be looking for an application, real engineering arises from a need or a problem or an opportunity.
- Engineering is based on the principles of mathematics and science. The math used may be simple algebra or complex partial differential equations, but math and science are foundational to engineering work.
- Engineering results in something of benefit to mankind.

Let's look at a few other definitions:

1. "[Engineering is} (t)he profession in which knowledge of the mathematical and natural sciences, gained by study, experience, and practice, is applied with judgment to develop ways to use, economically, the materials and forces of nature for the benefit of mankind." [1]
2. Engineering is defined as the "application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems". The term engineering is derived from "Middle English enginour, from Old French engigneor, from Medieval Latin ingeniator, contriver, from ingeniare, to contrive, from Latin ingenium, ability." [2]
3. "Engineering," says Goldberg, "is the social practice of conceiving, designing, implementing, and sustaining complex artifacts, processes, or systems appropriate to some meaningful need." [3]
4. Engineering is "the transformation of the natural world, using scientific principles and mathematics, in order to achieve some desired, practical end." [4]
5. Jordan proposes this definition, inspired by Billy Koen's Definition of the Engineering Method [5] "(Engineering is) the application of science and human experience to solve problems faced by people. This is often done in poorly understood or uncertain situations using the available resources." [6]
6. "Today an engineer is described as someone who has acquired and is applying their scientific and technical knowledge to designing, analyzing and building useful, helpful and functional works. This would involve structures, machines and apparatus, manufacturing processes as well as forecasting their behavior in particular environmental conditions. This is all accomplished with functionality, operational economics and safety to life and property forefront in mind." [7]
7. Engineers are those whom the engineering profession recognizes as members (for example, for purposes of membership in engineering societies – "at the professional level"). That way of identifying engineers would ask us to ask what, if anything, engineers – at a certain moment – contribute that others do not – that is, what significance their special standards of conduct have for others. The answer may well interest many in the history, sociology, and philosophy – technology because it provides a way to study what effect, if any, differences in profession have on the technology members of professions make or use. [8]
8. "Engineers are problem solvers. They are innovators and inventors, designers and creators. They are team players from a small group setting to a global perspective…We take problems or ideas, break them down, develop a solution and a path forward, and then turn it into reality." [9]

ENGINEERING DIFFERS FROM SCIENCE

To the public at large, suggests Henry Petroski, the image of the inventor of modern technology is someone in a laboratory somewhere wearing a white lab coat, in fact, a scientist rather than an engineer. [10] Engineering is dependent upon science, but engineering is not science. Engineering is not even applied science. While science strives to understand how things work in the natural world, engineering is about making things work. Engineering begins with a need to be addressed or a specific technical problem to be solved.

Engineering as practiced is the creative application of scientific principles to a problem with given specifications. In the case of the steam engine and the airplane, the earliest designs were completed before the science behind them was correctly understood. [11] The world needs both scientists and engineers, often working together to solve the large problems of society.

- The core activity of science is discovery.
- The core activity of technology is invention.
- The core activity of engineering is making. [12]
-

Theodore Von Karman, an early aerospace engineer wrote that "Scientists discover the world that exists; engineers create the world that never was." [13]

Unlike the painter and composer engineers almost never get to sign their work. Often a significant discovery will be associated with the name of a given scientist. The engineer will initial and stamp drawings and submit design reports, but the public is usually unaware of the identity of the designer of the bridge or the developer of the amplifier.

Up to the mid-20th Century, engineering was usually a response to a physical need. For example, steam engines were developed by Savery, Newcomen, Watt, Trevithick and others, to pump water from mineshafts. [14] Abraham Darby's efforts to refine iron production were motivated by the need for cheaper cooking pots; and the chlorination of water by John Snow was in response to the 1854 Cholera epidemic. [15]

Engineers may not typically be skilled at fixing cars or appliances, but engineering is concerned with problem solving, or fixing problems. We often portray the idea that we want to fix everything, hence the concept of tinkering with basic social structures, or "social engineering." We can, in fact, tinker with and alter much of nature, but is it always a good thing?

Today the press and the government have made a strong emphasis on STEM (science-technology-engineering-math) education, tying it to the future of our society. Young people are primarily interested in the aspects that (1) engineering is a field that helps people and (2) engineering is field with significant hands-on activity.

Students chose engineering careers because they have a knack for technical work, they enjoy the thrill of solving new problems, they want to make a difference in the world, and they are aware that engineering is a stable career in high demand. [16]

Engineering is also a very versatile background. Students who earned an engineering degree have gone to careers in law, medicine, business, education, and ministry.

BRIEF HISTORY OF ENGINEERING

Early cultures mastered the making of tools and weapons, as seen in many artifacts found in archaeological digs. When we think of engineering projects throughout history, several were enormous in both scope and personnel needed: the pyramids of Egypt, Roman aqueducts, and ancient cities, such as Ephesus in Turkey.

Early engineering provided the basis for construction, metalworking, water transport, military and agricultural tools.

Although the term "engineer" was not introduced for over a thousand years, individuals with great talent were present in Egypt, Greece, and Rome, designing and overseeing construction of the pyramids, bridges, roads, stadiums, and aqueducts. Pulleys and gears were employed in construction and transportation.

While Julius Caesar ruled the Roman Empire, a Roman building contractor named Sergius Orata invented central indirect house heating. That concept was to exert a far more lasting effect on civilization than any of Caesar's contributions to history, but when was the last time you heard anyone hail the glory that was Sergius Orata? And during the siege of Troy what then passed for the entire world heralded Hector and Achilles as heroes. Yet a contemporary of theirs, who invented the safety pin, remained unknown to posterity.

Today, history books tell us that the first man to be known by the title engineer was an Egyptian named Imhotep, who lived under the reign of King Joser in 2700 B.C. He is credited with building many of the early pyramids and with inventing the art of building in hewn stone. [17]

The Industrial Revolution saw human power replaced with machine power, primarily from steam engines.

An "engineer" was originally a designer/builder of military machines. Eventually these engineers became "military engineers" while developers of bridges, roads, and buildings for the public became known as "civil engineers."

"Civil engineering is the oldest of the engineering disciplines. It began as a distinction from military engineering to cover anything designed for civilian use. Since then it has gone on to become an umbrella term for anything related to infrastructure (roads, bridges), structures (factories, skyscrapers), and environmental concerns (water and sewage treatment)." [18]

Modern engineering (since the 19th century) has used math and science as foundations and now has a well-developed design process. Electrical engineering, Biomedical engineering, and Industrial engineering date to the 20th century.

Engineering in 1915 looked a lot like what we call Engineering Technology today, with a heavy emphasis on basic math and hands-on techniques. By the 1960's, particularly as a result of the space race, the educational emphasis was placed on higher math (through differential equations) and engineering science (statics, dynamics, circuits, thermodynamics…) with minimum design. Accreditation efforts in the 1980's made engineering design a major part of the curriculum.

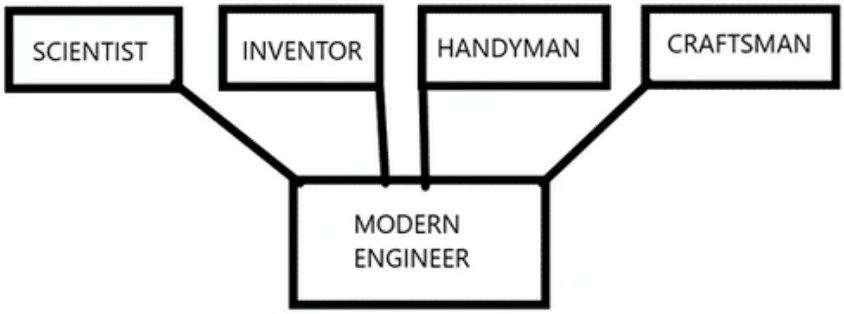
The twentieth century alone saw the development of affordable automobiles, airplanes, radio, television, radar, copy machines, transistors, computers, cell phones, robots, and the Internet. Engineering, it seems, goes through three phases in a culture, or functions primarily in one of these phases depending on the level of development of the culture:

1. Basic provision, maintenance of life (most basic level) -food, clothing, shelter, safety
2. Reparative/restorative -clean water, sanitation, better housing, disaster recovery
3. Cultural and technological advances (most developed level, once basic needs are met, and equilibrium is restored)- transportation, telephones, and computers.

ROOTS OF ENGINEERING

The modern engineer has four career ancestors whose skills merge in the current professional:

1. The craftsman, who implemented high quality finished products, especially from metals, without developing new devices
2. The handyman, who was able to fix or assemble things from available parts
3. The inventor, like Thomas Edison, who produced working devices and products without fully understanding the science behind them, and
4. The scientist, who studied and systematized the laws of nature but typically did not apply them to practical ends



Ideally, a modern engineer combines the skills of each of these: an understanding of the scientific principles behind working systems, a creative mindset to envision new solutions, and an ability to fabricate or assemble new devices.
Following William Rosen's propositions in The Most Powerful Idea in the World [19]), Craig Gay writes that the "Machine Age," or the age of modern engineering, really began with the invention and application of the steam engine. At this point in history "the wall between scientific theory and practice that had stood for centuries was finally broken down." [20]:

- Dozens of scientific principles were practically applied.
- In addition to inventive ingenuity, steps of analysis and design were used.
- Equations and calculations were absolutely necessary.

Unlike the windmill or waterwheel which use the forces of nature in ordinary ways, the steam engine used forces of nature in a new way, harnessing the power of water heated to steam. [21]

ENGINEERING ACHIEVEMENTS

As we look through history most of what we would consider to be major engineering advances would be large-scale systems and projects, rather than individual inventions:
A team of engineers was responsible for:

- Design of current automobiles and their manufacturing
- Development and functioning of the nation's electrical grid
- Design of the Space Shuttle, particularly the Command Module and Lunar Explorer
- Layout and construction plans for the nation's highways
- Design of all levels of computers and smart phones
- Development of machinery for processing and packaging foods
- Design of the cardiac pacemaker, prosthetic limbs, and the MRI machinery
- Purifying and pumping water to homes
- Design and manufacture of household appliances
- Alternate energy sources- photovoltaics and wind turbines
- Equipment for oil exploration, drilling, and pumping
- Equipment for processing hydrocarbons into plastics

VALUE OF ENGINEERING

Whenever we entertain a romantic idea that it would have been wonderful to have lived in a previous century, we need to recall how much of what we take for granted that didn't exist a century or two earlier: [22]

- Purified drinking water
- Sewage processing
- Refrigeration to prevent food spoilage
- Safe home heating
- Kitchen appliances
- Workplace safety
- Safe, efficient travel

Now you might think you would like to be Louis XIV, or Louis XVI, you might think you would like to have been Henry VIII and live in a palace. But if that were the case for you, even at best you would just be doing everything you could to make sure you ate, your family ate and all your subjects had enough food so they didn't starve to death and that your army was strong enough so that it could at least fight if another army engaged it. You might think you would like to have been in an eighteenth or nineteenth century king, but you would have had to do without electricity and all its powers, lights, telephones, radio, television, refrigerators, air conditioners, fans, VCRs, Xrays, MRIs, computers, the Internet, …and all other industrial automation. [23]

Leaders recognize that engineering is one of our most essential fields, for multiple reasons:

- Most of the products we use daily have been engineered and manufactured.
- Innovation and product development are keys to a growing economy.

- Many problems around the world have engineering solutions, including clean water, communication, lost limbs, and detection of weapons.
- International development relies heavily on technology: roads, water, safe shelter, small-scale manufacturing.
- Government leaders recognize the value of a STEM education.
- Engineers are hired even during a sluggish economy.
- A background in engineering can get someone into nearly any country on earth.

ENGINEERING DISCIPLINES & OCCUPATIONS

Engineering activity is responsible for the existence of most of the physical items we use each day as well as our economic progress. Engineering intersects with seven of the major sectors of our economy:

- Energy
- Utilities
- Industrial (manufacturing)
- Consumer products
- Technology
- Health Care
- Materials

Traditional disciplines of Engineering include:

- Chemical engineers- develop chemical processes and plants
- Civil engineers- develop structures, highways, bridges, dams
- Electrical engineers- develop circuits, electronic components, controllers, power systems
- Industrial engineers-
- Mechanical engineers- develop systems using machinery, heat, fluids, and engines

Recent additional areas include

- Aerospace Engineering
- Biomedical engineers- develop devices to assist the human body
- Computer engineers- develop computer hardware and interfaces
- Materials Engineering
- Materials Joining Engineering
- Systems Engineering

Engineers find work in a number of large industry groups:

- Aerospace/Aviation
- Chemical
- Communications
- Computers
- Construction

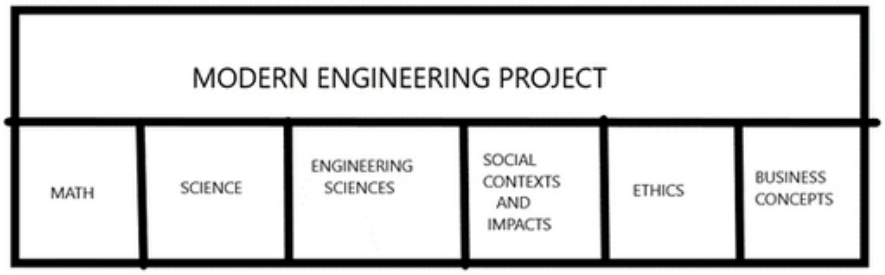
- Consumer Goods
- Defense
- Electronics
- Pharmaceuticals
- Utilities

For many, their job titles may reflect the nature of their work:

- Consulting Engineer
- Design Engineer
- Engineering management
- Engineering research
- Engineering sales
- Product development
- Production engineering
- Manufacturing Engineer
- Project Engineer/Project manager
- Systems Engineer
- Test Engineer

MODERN ENGINEERING

Twenty-First Century engineering requires considerably more content than the engineering that was practiced a hundred years ago. In addition to mastering math, science, appropriate liberal arts and "engineering science," graduates must be fluent in communication, skilled in basic design, capable of reasoning ethically, and able to work in teams. They need to understand the social-cultural context of their design, the economics of producing it, and the impacts of using it.



An NSF report titled "The Engineer of 2020" called for the next generation of engineers to be even more flexible, global, and creative. [24] Now that 2020 has come and gone we need to examine how well we've done.

PHILOSOPHY OF ENGINEERING

An interesting field of study has developed in the past few years known as Philosophy of Engineering (POE). Carl Mitcham, Daniel Goldberg, Ibo Van de Poel, Taft Broome, and Louis Buciarelli have approached engineering from a philosophical framework. [25], [26], [27], [28]

Taft Broome, for example, looks at engineering (as a "learned discipline") in three aspects: [29]

1. Foundations of engineering –mathematics, science, and humanities, based in Greek philosophy and literature –engineering as a popular learned discipline
2. Theoretical dimensions of engineering –engineering as a priestly discipline
3. Practical dimensions of engineering –engineering as a regal discipline

Learned content includes knowledge, values, praxis, practice, and skills.

A philosophy of engineering asks such questions as:

- What is the nature of engineering?
- Who is an engineer?
- What does an engineer do?
- What is the nature of engineering artifacts?
- What are the foundations of engineering ethics?
- How do we handle the products of engineering work (technology)?

Many of these topics will be touched in succeeding chapters, primarily from a theological perspective. It is our contention that many philosophical issues have basically satisfying theological answers, if we accept the reality of the God of the Bible. In addition, we should consider:

- How does God view our work?
- Where does our work fit within the larger plan of God?
- How does ethics relate to faith?

CONCLUSION

Former US President Herbert Hoover (educated as a mining engineer) wrote, "[Engineering] is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings jobs and homes... Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege." [30]

- Engineering is a human activity
- Engineering is a creative activity
- Engineering is a science-inspired activity
- Engineering is a social activity

In general, Engineering is a vocation ordained by God. Engineers make use of the physical laws and materials created by God. Engineers use their God-given aptitudes to develop solutions to bless others.

Rethinking our definition:

Engineering is the activity of developing technical solutions to meet the needs of humans (made in the image of God) using mathematics, science, and available resources to the glory of God.

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CHAPTER 3: FAITH

INTRODUCTION

In looking at "engineering through the lens of faith" the first question we must address is "What is faith?" The "faith" that is under discussion here is the Christian faith of the Bible. Since the Bible states that we are "saved" by "faith" it is essential that we get a handle on the meaning of this word. Over the past century our society has redefined "faith" to give it a meaning far different from the way the Bible uses it.

It has been said that he who defines the terms, wins the debate. Skeptics know this and take advantage of it. Witness some of the famous definitions of "faith" provided by unbelievers. Mark Twain, for example, quipped, "Faith is believing what you know ain't so." Closer to our own day, the atheist author Sam Harris defined faith as "the license religious people give themselves to keep believing when reasons fail." Richard Dawkins, perhaps the most famous atheist of our generation, claims: "Faith is the great cop-out, the great excuse to evade the need to think and evaluate evidence. Faith is belief in spite of, even perhaps because of, the lack of evidence." [1]

Not very satisfying for a logically minded engineer, right? What, exactly, do we mean by "faith"?

FAITH & EVIDENCE (BY BILL)

I teach in a Christian college, so I have the privilege of opening each class session with a spiritual chat, or "devotion." Because of my experience with people who have been brought up in Christian homes, I always start my first class in electrical engineering by asking the question "What is faith?"

Almost certainly someone will raise his hand and begin quoting Hebrews 11:1:

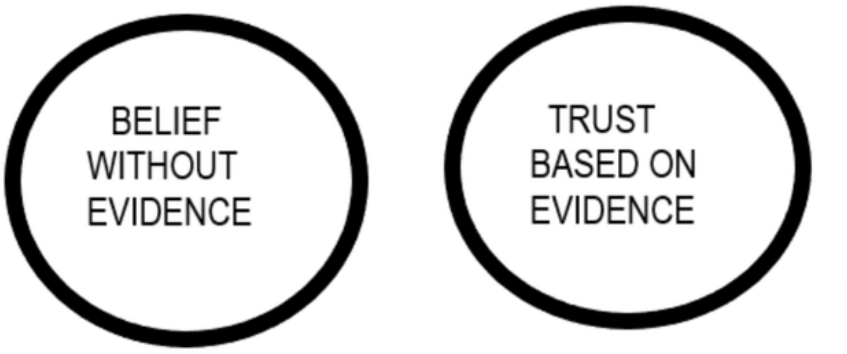
"Faith is the substance of things hoped for, the evidence of things not seen."

My reply is that Hebrews 11:1 tells us about faith, but it's not a definition; it's a description. If I say a lollipop is red and sweet, that just describes it. An apple is, too. I repeat my request for a definition of faith.

Another student will usually bring up "trust", and after a time of interaction we will have two definitions on the board;

Faith (number one) is "trusting in something in spite of the evidence against it"; and

Faith (number two) is "trusting in something because of the evidence for it."



TWO DEFINITIONS OF FAITH

At this point I tell the class that these are both valid definitions of faith in our society, and both are widely used; but they obviously have different (in fact almost opposite) meanings - so I ask them for a vote as to which is the "faith" referred to in the Bible.

There have been some days when nearly the whole class (about 35 students) voted that it was number one. Usually about two-thirds vote for it; almost always, it's a majority.

This is where I declare number two to be the Biblical concept of faith, and someone will immediately cite Jesus' rebuke of Thomas when he refused to "believe without evidence". But was this really the nature of the rebuke? Look at the facts: Tom had been with Jesus for maybe three years, saw him work miracles and probably even did some himself - he was one of those who went from town to town preaching and doing miracles (Lk. 9:2). Remember how excited they were about their experiences; "we even cast out demons by the power of your name," they said. But Jesus replied "Hey, I know that stuff is neat, and flashy, but the important thing is that your names are written in heaven." Tom had been told (along with the other eleven) repeatedly by Jesus that He would die and rise again the third day (Lk. 18:33); his closest companions, who had been with him for three years, came and told him - "Remember He said He was going to rise from the dead after three days? Well, He did, and we saw Him and talked with Him." In spite of ten eyewitness reports, he still didn't believe.

Tom was rebuked for lack of Faith number two - in spite of the overwhelming evidence, he still didn't believe. It only took two witnesses in court to condemn a man to death; that was Scriptural (Deut. 17:6). But he had ten, plus all of his own personal experience.

What positive evidence is there from Scripture that faith is not just a leap in the dark? Look up Lk.7:19-23.

John the Baptist was in prison. He was the guy who had pointed other people to Jesus as being the long-awaited Messiah; but at this point his spirits were a bit low - he was going to get his head chopped off soon, and he began to wonder - "could I have been wrong all along?" So he sent some of his own followers to get the final word straight from Jesus. They approached Him and asked, saying, "John wants to know are you really the One we've been looking for, or is it someone else?" Remember Jesus' answer? "Go tell John he's got to have faith! He should be ashamed of himself for not believing!"???

No...

He said "stick around, guys, and watch." Then He proceeded with His work, and after a while He said "go back and tell John what you see: the lame walk, the lepers are cleansed, the blind see, the poor have the good news preached to them - and happy is the one who is not offended in Me." Jesus simply told them to look at the evidence. His miracles were His credentials. "If I don't do the works, don't believe me," He said (John 10:37).

Faith and Feelings

A related property of faith is that it's not something that "falls upon you," but something that you do. Jesus rebuked His disciples for not having faith. I used to think that was a little unfair, since they couldn't help it if they didn't feel very faithful (before I realized what faith really is, I thought it was a feeling something like "courageous"). If faith is a leap in the dark, Jesus was condemning people for being logical; if it is a feeling, His condemnation was for the way they felt, and you can't control the way you feel. Either way, it's a frustrating concept.

As an illustration, let's look at Jesus' rebuke of Peter after he sank when trying to walk to him from the boat (Matt.14:25-32). When Jesus said "Oh, thou of little faith", wasn't He condemning him for acting logically (everybody knows you can't walk on water), or for feeling afraid (maybe he ran out of adrenalin)?

No...

Jesus rebuked Peter for not acting reasonably with the evidence he had. He began to sink after he had already walked on the water; he knew it could be done, not only because he'd seen Jesus doing it, but he had been doing it himself. In spite of all this evidence, because of the circumstances (the wind, here), he decided, "I can't be doing this", and he sank. Jesus' rebuke was for his inability to act on the facts. Faith is depending on the facts. Neither did Jesus condemn Peter for failing to have a feeling. Faith is not a feeling, but an action.

Results of an inadequate understanding of faith-

`1) It Messes up our communication with unbelievers

In our society, we have been brainwashed from every side into thinking that the proper definition of faith is number one - that is, leap-in-the-dark faith. When we witness and use this word, we may be saying "I've found this to be true", but we are communicating "I don't know if this is true, but I'd sure like to think so, and therefore there's no use in arguing. Don't confuse

me with facts. My mind is made up." This induces the witnesses to think something like: "Isn't that sweet. Well, ignorance is bliss, and I don't want to shake up his faith with the things I've found out about life"; and his retort is, "I'm so glad you can have that kind of faith. I just couldn't believe that way, though." I'm sure most of us have encountered this patronizing attitude when trying to witness to a friend, and wondered why we couldn't get beyond a superficial level of conversation. The problem is in our friend's understanding of faith.

2) It messes up our communication with believers

But there is another, dangerous, aspect of this problem.

Mark, a friend of mine, teaches the High School Sunday School class, and he decided to give this same type of lesson on faith there. He was appalled to find that 100% of the class thought faith was a blind leap in the dark! "What's worse", he said, "is that after an hour of teaching what faith really is, I took another vote at the end of the class, and found that half of them still believed it was a leap in the dark". Another friend, Paul, understands these principles well, and is careful to personally oversee the instruction of his children in spiritual things at home. Recently Paul asked his 9-year old daughter what faith was, and got the leap-in-the-dark answer. Surprised, he asked where she learned that. She replied "Oh, all the songs we sing teach it."

"You ask me how I know He lives...He lives within my heart".

If we teach people in the church, that faith is un-faith, then all our teaching is un-teaching. The more serious aspect of this wrong definition of faith, is that it has crept into the church. It's bad enough that communication about faith with the world has been cut off, which foils our witness; but communication within the body of Christ is also being cut off, and unless it is stopped it will destroy the church (as we know it now). Our next generation is being taught that faith is a leap in the dark, independent of evidence. Our emphasis on Hebrews 11:1 has been on "hope" and "not seen" rather than on "substance" and "evidence."

What Can I Do?

So, what can we do? Infiltrate and teach. Too long, the Christian's cry has been, "They don't have pure doctrine. I'm leaving and starting a new church where they teach what's right!" If you have some truth, get in there and teach it to the people who don't have it. That's what Paul did - in each new town he came to he taught in the Synagogue till they kicked him out. I don't mean that you should be sneaky and teach things behind the pastor's back; go through the proper channels. But stick with the church-don't go off and start a new church, or try to find one where they believe the same things you do. If you do, the very people who need this teaching won't get it. On the other hand, don't get sidetracked into some minor doctrinal difference, such as hair length or chewing gum in the services - go for the jugular: Contend for the gospel: that Jesus, the promised Messiah, died for our sins, just as the Scriptures predicted that He would, and that He was buried and rose again the third day, as the Scriptures had predicted; and that He was seen by many witnesses. The punch line is that it really happened -- not that we wish it had -- and there is plenty of evidence to support that conclusion. Faith is to trust that these things are true, because that's the reasonable thing to do.

RESPONDING IN FAITH (BY PAUL)

We've heard it for years- Faith is a leap, a blind leap, a leap in the dark, and the less certain it is, the greater the faith required, and therefore the better the "faither" (believer). Unfortunately, this concept is closer to the existential philosopher-theologian Soren Kierkegaard than to the Bible. The Bible's word for faith is pistis in Greek and simply means “belief.” The closest Old Testament word translates as trust. Faith is trust. Christian faith is trust in the God of the Bible, specifically in God's showing Himself in Jesus the Christ (Christ simply means "Anointed One.") Some describe faith with an acronym-"Forsaking all, I trust Him." The trust referred to here is trust totally in God, not in my "goodness," not in any actions I do, not in any religious organization, but in this powerful, wonderful, unpredictable Creator who loves me (and you) in a way that is beyond our imagining.

Faith is not blind and irrational, but rather a reasonable response to a large body of evidence. As Jesus taught with authority and performed miracles, people responded and believed in Him (John ...) Foundational evidence for Christian truth resonates with many engineers [2] and will the subject of chapter 7. Proverbs puts it this way: "Trust in the Lord with all your heart and do not rely on your own understanding. In all your ways acknowledge Him, and He will direct your paths." (Prov.3:5-6) God provides evidence that He is there and He has spoken, and we must respond. [3]

There is a huge difference between "Have faith in God" and "Just have faith." Mere “faith” is not effective. The object of faith is Christ Himself, the Lord of the universe. Not simply faith that God exists. Faith is trusting God instead of my own efforts for the forgiveness of sins and then trusting God for every part of life.

Faith is only as valid as whatever we place our faith in. Trusting in the God who created all things would be reasonable and valid. Fulfillment of any of the Bible’s promises depends on God’s character, which is absolutely trustworthy.

FAITH LIVED OUT

Once we have established that Biblical faith is not a blind leap let’s consider a few additional ideas:

1) We all exercise faith every day. Every time we sit in a chair, drive in a car, or fly in a plane we are trusting (based on our best understanding) that these things will perform their functions without danger to us. Everyone acts on faith in something all of the time- trusting that the furniture won’t collapse under me, that the car won’t lose control, that the airplane won’t fall out of the sky...

2) The Biblical emphasis is on the deep trust, not on the “not seen” of Hebrews 1. Is there an aspect of unknown or uncertainty? Of course.

-
- We can’t physically see God.
- We don’t know the future.
- We don’t have complete knowledge of any situation, but
- We do have sufficient evidence to warrant trust in God.

What about faith as a grain of mustard seed? It's not the size of the faith, but where the faith is placed.

Faith should be seen not as a leap but as a step, for which there is rational justification, the next logical thing to do based on what we know.

FAITH & EVIDENCE IN THE BIBLE

It is important to note that all of the Old Testament saints had some measure of evidence before they were expected to "step out in faith." Abraham could trust God with the life of his son Isaac since he had seen God supernaturally provide for Isaac's birth.

Hebrew 11 lists the "heroes of the faith." A closer look at their lives shows that (1) they all acted on their faith and that (2) their faith was not blind faith.

Person	Available Evidence
Noah	Testimony of Enoch; God's verbal call; detailed plans for the ark
Abraham	God's call; God's covenant ceremony; Isaac's miraculous birth when Sarah was 99
Jacob	Testimony of ancestors; wrestling with the angel
Moses	God's call; the burning bush
Joshua	Passover; Red Sea crossing; Sinai; manna
Samuel	Miraculous birth; God's verbal call
David	Family history; protection from lion and bear
Esther	Finding herself as Persian queen
Isaiah	Vision of God (Isa. 6)

In the New Testament, all of the disciples had the words and miracles of Jesus, the same data that drove the Pharisees to reject and plot against Him.

What about Peter walking on water? He had seen strong evidence of Jesus' power just hours before (the feeding of 5,000). He needed to have faith in Jesus alone. (Lesson: Don't take your eyes off Jesus or you'll sink.)

Our rejection of God is not for lack of evidence, but from our refusal to bow before Him. According to Rom. 1:18 we "suppress (hold down) the truth in unrighteousness."

FAITH & REASON

Christian positions

Christians have taken three basic positions on the issue of faith, learning, and reason: [4]

1) Faith vs. reason, emphasis on reason alone

"For Thomas Aquinas, medieval philosopher-theologian, reality had two levels, Nature and Grace. Nature could be studied by reason alone, but faith was needed to know the world of Grace. "(ref-same) Reason alone was all that was necessary for understanding the material world. Scripture and trust in God were only needed on Sunday or for devotional times, and didn't apply to the "real world." [5]

2) Faith vs. Reason, emphasis on faith alone

The argument here was that since God is all-valuable, academic pursuits are not worthy of our efforts. The resulting anti-intellectualism was a more recent approach. This position largely grew out of 19th century revivalism with its emphasis on feeling God's presence, rather than thinking about and responding to His Word. [6]

3) Faith and Reason Together

The third position acknowledges that God made all of the world, including our minds. Reason is thus a gift from God. Reason is useful, even to read Scripture, but unaided reason cannot bring us to a relationship with God.

Faith and reason are clearly linked. We trust our ability to think. As children we trusted what our parents and teachers told us. We do not believe that Christian belief is irrational.

Faith, says Augustine (of Hippo, an early Christian philosopher-theologian), is an essential ingredient of knowledge. ..Faith is not, like credulity, blind or arbitrary. To be credulous is to believe the absurd or irrational—or to believe without good reason. Right faith for Augustine is always a reasonable faith. [7]

FAITH & REASON: DIFFERENT CATEGORIES

Faith is often contrasted with reason, but this is a false dichotomy. The issue is really not "faith versus reason," since these are two different categories.

- Reason is a way of knowing
- Faith is a decision to trust, a belief in someone or something

The proper distinction would be two categories of knowledge: reason and revelation

We may use our human intellect to gain knowledge (i.e., reason).

Is it valid to use revelation (revealed knowledge, material revealed by God) as a valid source of knowledge? Some of the knowledge is not available elsewhere - God's love for mankind, the identity of Jesus, the Triune nature of God. The decision to accept revealed truth involves both reason and faith. Since part of God's revelation is history, that part can be verified.

Let's summarize this way:

(Biblical) Faith	Reason
Trust based on evidence	Understanding based on rational thought
Requires some reason	Requires some faith
Results in action (James 3)	Need not result in action
Necessary to please God (Hebrews 11)	Necessary to function in the world
Not opposed to reason	Not opposed to faith
A gift from God	Originated from God

We find these extremes in relating to reason and revelation (God's word)-

The concept that one can believe without any basis whatsoever is known as *fideism*.

The alternative is to trust only in our reason, or *rationalism*.

- Fideism – 100% "faith" – no evidence, no reason
- Rationalism – 100% human reason, no place for faith

Faith and reason are often juxtaposed as opposites, but the actual picture is somewhat different. At two opposites extremes of the spectrum we have

Rationalism – ----------Fideism

Problems with rationalism

1. It places human reason above everything (idolatry).
2. It does not address immaterial concepts like "love" and "grace."
3. It can remove any need or motivation to trust God ("I can figure it all out and handle it myself").
4. Human reason can be biased, blindsided, and faulty.
5. It is limited by the facts we currently have and our inability to know the future.

Potential consequences of fideism:

1. If faith is totally independent of reason, reason is always suspect. Science may not be respected.
2. Fideism can put all religious thoughts on an equal footing, with no way to distinguish between them.
3. If reason is demoted, faith may be depend on feelings. What makes you feel good? Do you get a "burning in your bosom"? If feelings aren't present, it can lead to despair.
4. Evidence may be neglected or disdained.
5. That which is most impossible or most irrational may be sought as being related to the most faith.
6. Believers may become gullible, accepting and passing on unfounded stories.
7. Believers may accept a "word of faith" theology, where believing and speaking something should cause it to happen.
8. The result can be an anti-intellectualism and disdain for all studies or an openness to superstition and magic.

Bottom line: We can't know God through reason alone, but real faith is reasonable. There is a place for both faith and reason in our lives.

God created us in His image as rational creatures. Our cognitive faculties were distorted by the fall, but they were not destroyed, and even unbelievers can use these faculties to discover truths about earthly things—as opposed to heavenly things, about which they are completely blind (Calvin, Institutes of the Christian Religion, 2.2.12-21). We do not fully comprehend God, but this is because we are finite and God is infinite. Faith and reason, rightly understood, cannot be and are not in any real conflict. [8]

TWO AREAS

Christians may speak of two areas of faith: "saving faith" and "daily faith." "Saving faith" would refer to the initial action to trust in Christ for forgiveness of sins. "Daily faith" would refer to trusting God for the day-in-day-out needs and decisions of life. We know these things:

- Faith comes by hearing God's word. (Rom. 10:17)
- Faith involves the action of God's Spirit. (1 Cor. 12:3)
- Faith involves an act of the will to trust in God, to receive Christ's work on our behalf. (John 1:12)

FAITH & ENGINEERING

Is there an aspect of faith involved in engineering practice? I would suggest that there is: We can't see the finished product when we begin the design. We trust our foundations in science and math to be able to produce the desired outcome. Hopefully we are also trusting God for every aspect of the process.

CONCLUSIONS

Faith is a key element in the Christian life, but is often misunderstood as a "blind faith". It is trust in God based on the evidence He has provided.

Finally, we find these powerful concepts about faith:

1) Faith transforms us.

Faith is not an addendum to our existence, a theological virtue, one among others. The faith to which we are called is the fundamental energizer of our lives. Authentic faith transforms us; it leads us to sell all and follow the Lord. [9]

2) Faith impacts all of life.

The idea is not, once again, that everything in the life of the believer is different. The idea is rather that no dimension of life is closed off to the transforming power of the Spirit—since no dimension of life is closed off to the ravages of sin. [10]

3) Faith is fundamental to our spiritual existence:

- We are justified by faith. (Rom. 5:1)
- We live by faith. (Rom. 1:17)
- We walk by faith. (2 Cor. 5:7)
- We wage spiritual warfare using the "shield of faith." (Eph. 6:16)
- We overcome by faith. (1 John 5:4)

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CHAPTER 4: CHRISTIAN TRUTH

INTRODUCTION

Christianity is first of all a living relationship with God and then, simultaneously, a worldview/philosophy, a set of doctrines, a lifestyle, and a set of religious practices (worship, baptism, and communion). It is absolutely tied to the deity of Jesus Christ, His death on the cross, and His resurrection from the dead. It is not based on a set of proof texts, but is a complete system based on the entirety of the Bible.

Christians agree on certain foundations:

- God the Creator
- Deity of Christ
- God-inspired Bible
- Death and resurrection of Christ
- Salvation by grace through faith
- Changed lives
- Final judgment and eternity

In this chapter we'll look at the nature of God, the Trinity, salvation, three huge concepts (Grace, Love, and Truth), and some major themes in Scripture.

GOD (BY PAUL)

The God that we trust in is not just any god. This is the God of the Bible, Who created all things and reveals His nature to us.

The Bible starts out with this sentence: "In the beginning God created the heavens and the earth." (Genesis 1:1) There's no definition of God, no explanation of God's activity "before" the beginning. We learn from Scripture that God is the Creator of all, that He sustains His Creation, that He is absolutely holy, that He loves humans, and that He sent Jesus to earth to rescue and restore us. From Scripture we conclude that He is all-powerful (omnipotent), all-knowing (omniscient), and present everywhere (omnipresent). He is also apparently omnitemporal, in that past, present, and future are all visible to Him at all times. Francis Schaeffer spoke of God as "the Infinite-Personal God".

From Scripture we learn of God's nature. He is absolutely:

- Loving (I John 4:8, John 3:16)
- Holy (I Peter 1:16, Ps. 99:9)
- Just (Daniel 9:4, Rom. 3:25-26)
- Truthful (Isa. 65:16, Deut. 32:4)

In addition, God is simultaneously revealed as Father, Son, and Holy Spirit. The basic nature of God, in fact, "solves" some of the deepest questions of philosophy:

1) What is the interaction of matter and spirit?

Philosopher Immanuel Kant grappled with this question in the 1700's. From Scripture we know that matter didn't exist before God created the universe.

2) How do we deal with "the one and the many", the issue of unity amidst diversity?

God Himself is both One and plural. He reveals Himself in Scripture (in ways that boggle our finite minds) as Trinity, eternally Father, Son, and Holy Spirit.

3) What is the nature of time and eternity?

God's revealed name, transliterated as YHWH and sometimes pronounced Yahweh, comes from the present form of the Hebrew "to be." God refers to Himself as "I AM" (God who is always there). God created time when He created the universe and is simultaneously present at every moment of time.

Since God is both infinite and spirit we don't have words to explain Him. Scripture provides us with models and analogies:

God is like a Father (2 Cor. 6:18, Eph. 4:6)
God is like a Shepherd (Ps. 23:1, Mt. 18:12-14)
God is like a Fortress or a Rock (Ps. 18:2, Ps. 62:6)
Since God made and loves the world,

- He desires all people to know Him;
- He wants people to flourish;
- He desires people to be blessed by His followers;
- He wants our lives to be meaningful;
- He desires that we use the gifts and skills He has given us;
- He wants human needs to be met;
- He desires restoration from the results of the fall; and
- He wants the world to see glimpses of His coming Kingdom.

GOD'S NAME (BY BILL)

The third of the 10 commandments is that we should not take the name of the Lord in vain. (Exodus 20:7) The first phrase in "the Lord's prayer" is that the name of the Lord be hallowed. (Matt. 5:9)

In the days of Jesus, the command to not take the Lord's name in vain is carried to an extreme (as usual) by the Pharisees. In order to avoid using the name in vain, they refused to even pronounce it. This was not only extreme, but sinful, since (Deut. 12:4) they were commanded not to blot out the name of the Lord, just as they were commanded to blot out the name of the other gods they encountered in Canaan. ALL the gods had names, such as Ashtoreth, Baal, and Milcom. (The Lord's name is Yahweh, which means "He who is'" or "the God who is actually there". This is the name we are to use if we pronounce it, but if God Himself were to pronounce it, He could use Hayah Asher Hayah, or I am that I am. This is how he referred to Himself at the burning bush. (Ex. 3:14) These are undoubtedly the words Jesus used in John 8:58, as we can tell by the reaction of the Jews there (they tried to stone him). The fact that the Bible records the use of the name Yahweh by godly men throughout (especially in the Psalms, which were written by David to be sung) shows that there is nothing wrong with pronouncing the name Yahweh. (You can tell when the Hebrew word is Yahweh by the fact that the word is always translated to “LORD" in capital letters.

The word Hallelujah means "Praise the Lord", and uses a contracted for of God's name, "YAH". Thus the word "HALLELUJAH" should only be used when considering what it means, or as a prayer or exhortation. Otherwise it is using the Lord's name in vain. To use the Lord's name in vain is simply to mention it lightly or thoughtlessly, as well as to deliberately defame of make fun of it.

The definition of truth is "that which actually exists'" which is again the meaning of God's name. Truth is therefore a very important quality of God. We find that He cannot lie, (Titus1:2, Heb.6:18) and that Jesus called Himself the truth (John 14:6). The truth relates what is said to what happens. If what is to happen is in the future when the word is spoken, we refer to it as a promise, or oath. We also know that God does not break his oaths, and commends us not to either. One of the sins which was considered so bad that even the Gentiles were judged for it was a broken promise (Amos 1:9). God even honored, and held the Jews to honor, a promise made to the Gibeonites under false pretenses (Josh. 9:3-27, II Sam. 21:1). Jesus taught that we should not only honor oaths, but that there should not even be a difference between and oath and the statement "yes" or "no"- that is, we should not have several levels of truthfulness, but what we say should be true without qualification. (Matt.5:33-37) James expands on this theme, saying it is important above all things (James 5:12). The difference between fornication and adultery, which was punishable by death in the Old Testament, is a promise. A promise is what binds a marriage together, (and God considers it indissoluble) and it is a promise that brings us eternal life.

God's nature is truth, and His Name reveals his nature.

JESUS IS GOD (BY PAUL)

If we hold the Bible as true, then all of the data (what the narrative says about Jesus, what Jesus said, and what others said about Jesus) points to the fact of Jesus Christ being God as well as human (man).

- You shall call His name Immanuel, God with us. (Mt. 1:23)
- In the beginning was the Word, and the Word was with God, and the Word was God. (John 1:1)

- "Your sins are forgiven"...Who can forgive sins but God alone? (Mk. 2:5-7)
- Miracles, including healing, controlling the weather, feeding a multitude, and raising the dead.
- The Son of Man is Lord of the Sabbath. (Mt. 12:8)
- Peter: "You are the Christ, the Son of the living God." (Mt. 16:16)
- "The Father and I are One." (John 10:30)
- "If you have seen Me you have seen the Father." (John 14:9)
- "Before Abraham was, I AM." (John 8:58)
- Jesus' "high priestly prayer" to His Father (John 17)
- Thomas: "My Lord and My God." (John 20:28)

Jesus' ministry involved teaching, healing, miracles, and interacting with people.

JESUS' TEACHING & EVANGELISM (BY BILL)

As we look at Jesus' life in the Gospels we see that He was continually and unexpectedly dropping little bombshells on His disciples. He wanted them to know (1) that the legalism of the Pharisees was not God's intent, (2) that they were sinful people, (3) that God was no respecter of persons, and (4) that He was the promised Savior -Messiah:

- You have to forgive. (Mt. 18:21-35)
- You can't divorce your wife to marry someone else. (Mt. 19:4-9)
- You can't trust in riches. (Mk. 10:23-25)
- The Pharisees are whitewashed tombs. (Mt. 23:27-28)
- Prostitutes and tax-collectors enter heaven before Pharisees. (Mt. 21:31)
- The Father and I are One. (John 10:30)
- He who has seen Me has seen the Father. (John 14:9)
- The Son of Man has to suffer and die. (Mt. 16:21)

THE HOLY SPIRIT (BY BILL)

Jesus promised to send "another Comforter," known as the "Holy Spirit." From the Scripture we learn numerous things about the Holy Spirit:

- The Holy Spirit is a Person (John 14:15-17, Acts 8:29).
- The Holy Spirit is sent from the Father to believers (John 14:16).
- The Holy Spirit is God (Acts 5:3-4).
- The Holy Spirit somehow indwells believers (John 14:17).
- The ministry of the Holy Spirit includes convicting of sin (John 16:8), revealing Jesus
- (John 15:26), teaching truth (John 14:26), enabling true worship (John 4:23-24), guiding us (Rom. 8:14), helping us to pray (Rom. 8:26), encouraging (Acts 9:31), and empowering for service (Acts 1:8).
- The Holy Spirit produces spiritual "fruit" (Gal. 5:22-23) and gives spiritual "gifts" to serve the church (I Cor. 12:4).

John 3:8 indicates that when you have salvation the Holy Spirit guides you, and non-Christians can't tell where you're coming from or where you're going. You may do strange things in their eyes (like loving enemies and wanting to avoid sin) because they don't see the source of your direction (the Holy Spirit).

The Holy Spirit is a Person, so when you have Him you have all of Him. (When you receive Christ you have all of Him, not just an arm or a leg.) You can't really have more or less of a Person in you, but His power may be manifested to a greater or lesser degree (depending on obedience and submission).

Acts 6:3-6 tells us about the first deacons. They had to be filled with the Spirit even to wait on tables effectively. We can do no job for God effectively in our own strength.
Because the Holy Spirit is God and yet is different from God the Father and from Jesus the Son and because "Father, Son, and Holy Spirit" are grouped together in Scripture, we refer to God as "Triune" or Trinity.

TRINITY (BY BILL)

The Bible reveals God as Triune in nature- Father, Son, and Holy Spirit, one in essence. It is very important that God is One yet plural, as the sh'ma says "Elohenu echad." The Lord our God (plural), the Lord is One. This means that God had the capability of loving before He created anything. There was love between the members of the Trinity, so God didn't have to create someone to fill His need to love. He wasn't lonely in the beginning. Jesus expressed this when He prayed to His father (John 17:5-24) before He was crucified, saying, "For You loved Me before the foundation of the world." If God were not plural then He would have had to create somebody to in order to fulfill His capability to love, and He would therefore be less than God, since He would not be sufficient in Himself.

Implications of the Trinity

True Christianity is not an add-on to Judaism; it's all one thing, clear from the beginning - God is Yahweh (singular) and He is Elohim (plural) - a singular plural. Actually, the concept of a Trinity solves a fundamental philosophical problem - of unity and diversity.

The Christian worldview is the most complicated, because it says there is a supernatural power that cares for mankind - that means that God loves mankind; so that, in the beginning, there was God, Who was capable of love. The problem that emerges here is that if He is alone before creation, then He is frustrated, because He wants to love, but there is nobody to love, so He has to create somebody; He is incomplete. But if God is incomplete, He's not really God. The concept of the Trinity is that in the beginning the is - in the real beginning, before there was any universe created, God was the Father, the Word, and the Ruach Ha Kodesh, the Holy Spirit, all together as one and yet there was love between them - perfect love with no confusion or lack of communication. They were really one, like in a perfect marriage. God says in Gen.1:23 - that Adam and Eve become "one flesh", echad, and when the spies returned from

the Promised Land, they had one ("echad") bunch of grapes - a compound unity (Numbers 13:23). This is the same "one" used in the Shema - (The LORD our God is One - Deuteronomy 6:4) (which used both Yahweh and Elohim).

There are several passages in the Scripture in which God refers to Himself as "we" - all through Genesis 1 He is referred to as Elohim, which is plural, and in Genesis 1:26 He says "let us make man in our image", He does it again in Genesis 3:22 and Genesis 11:7, Isaiah 6:8, and Isaiah 48:16. You might also look up Isaiah 53, Micah 5:2, Isaiah 7:14, and Isaiah 9:6.

If you have a god that is pure unity, and proceed logically, you eventually come to the god of Islam, Allah. That god cannot love, because love is seen as a failing in the system. Allah does not care for mankind, because if he did, mankind could affect him, and he would not be omnipotent. We have an infinite-personal God, Who loves us so much that He gave us free will - the ability to oppose Him; but His love extended even farther, in that He personally took our pain, punishment for our rebellion, so that we could be reconciled to Him. The blood of bulls and goats can't really take away sin - the sacrifices were to be a testimony to God's people that sin had to be atoned for, until the time was just right for God to make the ultimate sacrifice of Himself as the Passover Lamb for our sins - after that, there was no longer any need for a temple or animal sacrifices.

God came down and lived in a body for a while - but how could He do that if He wasn't plural, so Someone was still running the universe while He was Here: Yeshua was the unique Son of God, and His time on earth marks the focal point of all history - if He really rose from the dead, He deserves our attention.

THE GOOD-BAD CURVE (BY BILL)

In the course of my teaching I have developed a visual aid which has especially helped me to share the gospel with engineering and science majors. It is presented here so that others can use it, too.

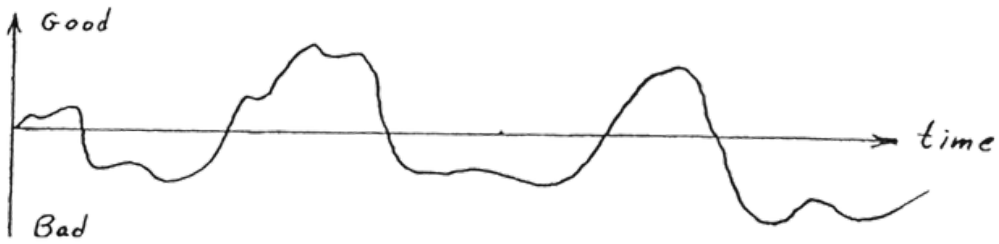
"Sure, Jesus was a great teacher, but what makes Christianity different from any other religion in the world?"

I'm glad to hear this comment, because it's my cue to ask:

"Well, have you ever seen the 'good-bad curve'?" (I know their answer will be "no" because I made it up ·myself).

At this point I find a piece of paper or an unused white board, and present the curve as follows:

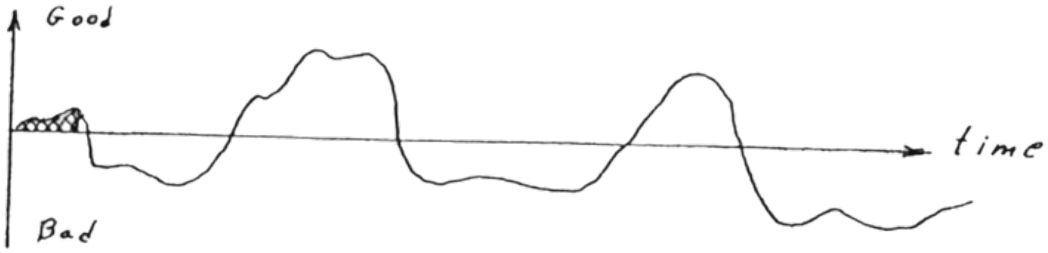
First, I draw a set of axes and label them, explaining as I go:



"Most religions have some system of morality arid rewards like this" (here, I draw in the wiggly line. Just about any curve that hops up and down between the "Good" and "Bad" halves will do).

As a person goes through life, he does some 'good' things and some 'bad' things, the determination of 'good' and 'bad' being 'what God think s of it'. Your standing with the god of that religion is either a 'point function ' or an 'integral function ', depending on the religion (for those of you who are not familiar with calculus, that means your standing with god either depends on what you are doing at the moment, or it depends on the area under the curve· so far, representing an average of all you've done previously.). Most religions use integral functions, so that the rewards or punishments depend on the area under the curve."

(Here, I begin to shade in the here area under the curve, moving slowly to the right as I explain)



So that until now; he's been pretty good, and has stored up credit with god, and if he should happen to die here, he would go to heaven, or god would like him, or he'd be reincarnated as something nice, or what the reward is for that particular religion (I move on, shading into some 'bad' area).

Now he's started on some kind of a binge, doing things god doesn't like, and it begins to cancel out the good he did before. It's as if god has some great balances in the sky, and the sales are beginning to tip toward neutral. He's losing favor with god. (I keep on shading to the right until the negative area below the curve exceeds the area above the curve).

By this time, his 'bad' area exceeds his 'good' area, so if he should die at this point, he'd go to hell, or get some punishment, or be reincarnated .as a worm and stomped on by an elephant. And so it goes - god keeps track of how good or bad you've been throughout your life and when it's over, your reward or punishment is proportional to the net area under the curve. Net

positive area (in the 'good' half), and you get rewarded; but if you had most of the area below the line, you are punished. This is the 'good-bad curve' for religions other than Biblical Christianity.

People have commented to me that at this point they said to themselves "It is? That's exactly the way I believe."

Now I make a new set of "good-bad" axes, and announce that I'll show the good-bad curve for the Christian system.

I tell them that this is an integral function; that is, punishment or reward is proportional to the net area under the curve, as before. "But," I go on, as I draw in the curve itself, "there's something basically different about this curve:"

(It may have a similar shape, but every bit of it is below the axis.)

In the Christian system, we're dealing with a perfect God, whose standard is, therefore, perfection, Jesus said that we should be as perfect as our Father in heaven (Matt 6:48). James said that if you can even think of a good thing to do, and then don't do it, then it's sin (James 4:17). So, as far as doing anything 'positive' is concerned, in that it will 'cancel out' something bad you've done previously (or in the future), it's impossible. The best we could do would be to live in perfect obedience – loving God with all our hearts, minds, and souls, every minute of every day, all the days of our lives. (Matt 22:37). This is just what God expects of us; it's no extra, so that no part of it can be converted to brownie points or green stamps, to be used if we mess up later.

You can't do better than God expects of you; because you can't surprise God. Can you imagine God looking down off a cloud one day and exclaiming 'Gloryoski! Smedley Vark just stopped and helped that guy change his tire. I never thought of that! I'll give him 10 brownie points!' No, and if His standard was less than perfection, someone could come along and make up a better standard than God's. It's all very reasonable if you're dealing with a God who is perfect."

I usually dwell on this subject until I get some kind of feedback to the effect that "If that's Christianity; it sounds pretty dreary. Doesn't sound like anybody's got a chance." This is a good time to point out that the Bible says so, too, in Rom. 3:23.

So far, this is not good news. Our commission is to tell the good news, but lots of people don't think they need the good news we have to tell – because they don't think they're "sinners". This is for several reasons, and I think the most important are the following two.

First, the definition of sin has been changed, in our society, to mean “tough luck” This is reflected in statements like “He couldn't help it: he was born into a low-class family”, o “these are the genes I inherited, so that’s why I act this way”, or, simply “That’s the way I was taught” The concept of true guilt has largely been lost to our society , so that the responsibility for actions has gone with it, and it's obviously unfair to punish someone who is not responsible for what he does. A person who has this philosophy doesn’t see any need for salvation, because he sees no reason for God to punish him in the first place. “Whaddaya mean, ‘saved’?” he'll say, "Saved from what?"

Secondly, a person in today’s society is not familiar with God’s standard for righteousness. Many people have developed their own standards, usually according to the following recipe: the goals must be easily attainable, and that which is forbidden must not be too tempting. This system must not be too easy to live up to, for two reasons. One reason is challenge: you have a feeling of accomplishment if you can do something others cannot. The other reason is pride: you need justification for looking down on others. Everybody has some moral standard, even if they claim not to; the proof is that they accuse other people of doing what they “shouldn’t” (by their own standards), and excuse themselves for certain actions (See Rom. 2:15). Therefore, whoever you may be talking to will have some standard; it will simply be too low to fit the Biblical pattern (an Electrical Engineer would say that the d.c. value is too low).

Another interesting related fact is that Satan will try a person on whatever standard he has made up for himself; and it will be harder to keep that standard than he thought when he made it up - so the standards usually change as time goes on ("How was I to know, when I decided never to eat ice cream again, that I'd be trapped for a week in an ice cream factory?") There's an interesting illustration of this effect. What are Mormons famous for? The answer I usually get to this question is “they allow more than one wife” (or at least they did before the law cracked down on them). The Bible doesn’t specifically say "thou shalt not have more than one wife," but did you know that the Book of Mormon does? (Jacob 1:15, 2:24,27). This pattern of Satanic testing applies whether you are a Christian or not.

The good-bad curve is mainly an argument to counter this second problem - it simply puts the standard where it ought to be: above our easy reach.

At this point I usually refer to the system of laws ·and sacrifices in the Old Testament, emphasizing that God gave the sacrificial system as well as the laws - a provision for what to do when the laws were broken. Notice that God didn’t tell them to do something extra good to make up for sins; He prescribed the shedding of blood. Heb. 9:22 sums it up by saying that without shedding blood, there's no way to get rid of sin.

What do the sacrifices illustrate? The concept that we can transfer punishment. One person could take the punishment for another person's sins,- (if that person didn’t have any of his sins to pay for, which is illustrated by the fact that only the best and unblemished members of certain "clean" species were acceptable sacrifices) and that would be O.K. with God.

Suppose my Dad had never sinned, for instance, and that I had. He would then merit eternal life, being perfect. I might come to him and say,

"Dad, you've never sinned, so you deserve to go to heaven".

"That's right, son", he'd say. It wouldn't be boasting; it would just be true. He would have no false modesty, either.

"And I've sinned, so I've gotta go to hell".

"Right, son".

"Well, I've got a deal I'd like to make with you. How 'bout you take my place in hell forever, and I'll take your place in heaven?"

If I could make the deal, without twisting his arm, it would be all right with God. But if he was the only righteous man in the world, I would be the only one who could get into heaven on his merits. One eternity of hell for one lifetime of sin. Nobody else could get in on his righteousness. He only counts as one man.

But Jesus Christ is man and God. His death counted as punishment for the sins of all men, since He has the "weight" of being God. Furthermore, since He is God, He was able to take the punishment of an eternity in hell in the time ·He was on the cross - a finite time.

What must a person do to appropriate this gift? If it was a thing you had to do, you could count it as a work; and that would be counting it as some positive thing which you would use to cancel out negative area. The work has been done already - by Jesus Christ. He's paid for the negative area under your good-bad curve. All you have to do is agree to have it transferred to Him.

Problems With Good - Bad Theology

If we hold to the idea that the horizontal axis runs through the center of our graph and that "good" can cancel "bad" we will run into these problems:

- This is not the message of scripture.
- This obscures the Gospel and keeps people from salvation.
- This makes God less than perfectly holy.
- This fails to address the damage done by sin.
- This diminishes the death of Christ and the love and grace of God.
- This has no place for divine forgiveness.
- With this system you can never know that you've done enough.

SALVATION (BY BILL)

Salvation is a word that you typically only hear in Christian circles. It is a noun form of the verb "to save" and implies a rescue. Believers are rescued from sin, death, and Hell.

It is important that we emphasize that people are not lost because they don't Jesus' name. People are lost because of their sin.

Similarly, we must insist that good people do go to heaven. (Rom.2) Otherwise, God is not perfectly just. The issue is that they must be really good (perfect), never having sinned at all. Unfortunately, that leaves out me and everyone I know. (Rom. 3:23)

The Gospel is not magic words. There is no set of words that someone says or prays that makes one a Christian. ("Gleeb in farb and thou shalt be zapped.")

Salvation is not a feeling. It may be accompanied by a feeling, but it requires an act of the will.

Salvation is not imitating what Christians do. We can't paint red spots on our face and expect to have the measles.

Salvation involves responding to the Gospel (the good news), embracing the truth, asking for forgiveness and expecting to receive it.

The Gospel is all about grace (unmerited favor). If you think you can earn it you've misunderstood the ugliness of your sin and the depth of God's love.

How people miss salvation

- They think they're pretty good (not sinners; no real need for a Savior)
- They think they can earn their way (see the Good-Bad curve)
- They don't understand grace -all a gift
- They think they can copy the Christian life ("measles theology")
- They think Christianity is somehow magic words

Sacrifice

The Old Testament Law specified blood sacrifices for sins. Unlike pagan religion, these were not magical/superstitious rituals to appease a deity and receive benefits. Old Testament sacrifices prefigured the perfect sacrifice of the Son of God.

Old Testament sacrifices were an object lesson, showing the bloody ugliness of sin and the link between sin and death.

Old Testament sacrifices should have been somewhat a deterrent to sin, since sacrifices for sin were costly. John Fischer once said that as modern people we miss some of the object lesson of the sacrifices. We might take sin more seriously if when we sinned we had to lug in a bull and slaughter it at the altar or bring in a new truck and set it on fire.

Descriptors

The Bible uses many descriptions of life before and after Christ-

- Dead/now alive
- Blind/ now seeing
- Lost/ now returning home

- Desperately sick/ now healed
- Aliens and exiles/now citizens
- Strangers and enemies/ now family

Blessings of Salvation

According to Scripture, Christians are:

- Rescued (saved) (Eph. 2:8-9)
- Forgiven (Eph. 1:7-8, I Cor. 6:11, Ps. 103:10-12)
- Cleansed (I John 1:7)
- Born anew (I Pet. 1:24)
- Restored (2 Cor. 5:17)
- Adopted (Rom. 8:15)
- Shown mercy (Heb. 4:16)
- Made alive (Eph. 2:5)
- Made righteous (Rom. 5:9)
- Justified (Rom. 5:1)
- Given hope (I Pet. 1:3)
- Given purpose (Eph. 2:10)
- Given gifts (Rom. 12:6)
- Empowered (acts 1:8, Phil. 4:13)
- Directed (John 16:13)
- Set apart for God (Deut. 14:2)
- Freed (John 8:36, Gal. 5:13)
- Given an inheritance (I Pet. 1:4)
- Reconciled (2 Cor. 5:18)
- Healed (I Pet. 2:24)
- Given peace (Rom. 5:1, Phil. 4:6-7)
- Ransomed (I Tim. 2:6)
- Given access to God (Eph.2:18, Heb. 10:19)
- Risen with Christ (Col. 3:1)
- Placed into Christ's Body, the Church (I Cor. 12)
- Transferred into God's kingdom (Col.1:13)
- Brought into God's family (Eph. 2:19)

GRACE (BY PAUL)

Grace (*charis* in Greek) is the "unmerited favor of God". Grace is tied to salvation (as a gift) and to the gifts of the Holy Spirit. (I Cor. 12) It reminds us that our very life and our next breath are gifts, and that we are totally incapable to making ourselves right with God. Grace is also related to God's enabling to live for Him (Titus 3:4-7).

The Christian life is all about grace, from salvation to Christian living to the life everlasting. In the scripture we find several people who did not understand grace:

- The Pharisees, who were upset that Jesus received and forgave sinners
- The prodigal son's older brother (in the parable in Luke 15), who couldn't rejoice that his brother returned home safely and was celebrated by his father
- The workers in the vineyard (in the parable in Mt. 20:1-16), who thought it unfair that those hired later in the day received the same pay as they did
- The "rich young ruler," (Mt. 19:16-22), who asked, "What good thing must I do to inherit eternal life?"
- The unforgiving servant (in the parable in Mt. 18), who was forgiven an astronomical debt but couldn't forgive a fellow slave who owed him a few dollars.
- What about God's mercy in the Old Testament? Wasn't God just angry?
- As we read the history of Israel we see God's mercy: God rescued His people, brought them into a promised land, gave them a way to relate to Him, and forgave their sins. Over and over He sent judges to deliver them and prophets to warn them. He brought them back from exile and restored their nation.

LOVE (BY BILL)

"Jesus loves me, this I know, for the Bible tells me so."

The Bible tells us that

- God is love (1 John 4:8) and that He loved us first. (1 John 4:19).
- The greatest commandment is to love the Lord our God (with all aspects of our being). (Mt. 22:37).

Since God is a God of love His followers should be people of love.

- We are commanded to love one another. (John 13:34, 1 John 4:7-8)
- We should love our neighbor as our self. (Mt. 22:39)

The Greek word translated as "love" in all these verses is *agape*, which is sacrificial love, love which desires, seeks and does what is best for the one loved, often at great personal cost. God reveals His love through His grace and mercy. The most profound expression of God's love is John 3:16: "For God so loved the world that He gave His only-begotten (His uniquely made human) Son, that whosoever believeth in Him should not perish but have everlasting life." Romans 5:8 adds, "The proof of God's amazing love is this: While we were still sinners Christ died for us."

Love is one of the all-important concepts in Christianity and one that is often misunderstood. We must not think of love as a feeling but rather as a decision, a willful action, since we are commanded to love, even to love our enemies. If love were a feeling it could not be commanded. Feelings can come and go, but love involves a commitment and a resolve to act in loving ways. Let's try this for a definition: Love is a deliberate choice to do what is best for another, even at deep cost to oneself.

Marriage will involve feelings, attraction, and friendship (all different kinds of love), but agape love must be the foundation, to weather the storms of life, and this is the love that appears in the Bible. God is the source and empowerment of *agape* love.

Corinthians 13 is often called the "love chapter," since it describes many of the aspects of love: patience, kindness, humility, unselfishness, respect, forgiveness, trust. Another key facet of love is faithfulness ("Love never fails."): sticking with someone through hard times and even when they "don't deserve" our love.

What does it mean to love your neighbor (as yourself?)

- To desire a "good life" for them
- To desire growth in Christ for them
- To have genuine concern for them
- To help to meet their needs
- To make sacrifices for them (Love always involves sacrifice.)
- To take steps to protect them
- Doing loving actions even to unpleasant people.

John 13:35 tells us, "By this shall all men know that you are my disciples, if you have love for one another." Francis Schaeffer put it this way: Based on John 13, the world has a right to judge whether we are Christ's disciples based upon the love that we demonstrate.

Furthermore, based on John 17:23, the world has a right to judge whether the Father sent the Son based upon the unity that we show.

TRUTH

We learn from Scripture that God is a God of truth.

- He is the God of truth (Isa. 65:16).
- Jesus is "the Way, the Truth, and the Life" and the only way to the Father (John 14:6).
- "God is not a man that He should lie." (Num. 23:19, Titus 1:2).
- "God is light, and in Him is no darkness at all." (1 John 1:5)
- "All His work is done in truth." (Ps. 33:4)
- "Let God be true and every man a liar." (Rom. 3:4)
- "We are in Him who is true." (1 John 5:20)
- "Your word is truth." (John 17:17, Ps. 119:160)

Truth, then, is definitely not relative or subjective. Truth conforms to reality and is consistent with God Himself. Truth is what God sees and says.

In John 8:32 Jesus tells us that "you will know the truth, and the truth will set you free." There is, however, a requirement involved when we read the entire statement in context: "If you abide in My word you are truly My disciples, and you will know the truth, and the truth will set you free."

As a result, His followers should be people of truth. We shouldn't fear truth or fear pursuing reality.

- Walk in truth. (1 John 3:18)
- Speak the truth in love. (Eph. 4:15)
- Whatever is true…Think on these things. (Phil. 4:8)

- Love in deed and in truth. (1 John 3:18)

Truth for the Christian means

- People should be able to count on our word.
- We must keep our promises.
- We should avoid "white lies" and exaggeration.
- We should be honest about our struggles and doubts.

GRAND THEMES IN SCRIPTURE (CHRISTIAN THEOLOGY)

As we read through the Bible at least four areas stand out as "grand themes" that run throughout Scripture and tie it together: (1) The drama of redemption, (2) the glory of God, (3) the kingdom of God, (4) human flourishing.

Grand Theme #1- The drama of redemption

This is the piece that explains all of human history and connects past, present, and future. Some call it "God's Grand Story" or the "Drama of Redemption." Christian thinking looks at the history of the world in terms of four major events: Creation, Fall, Redemption, and Restoration.

Creation (Gen.1)

By His actions in creation, God set into place everything that exists, including humankind. Nothing that exists is purely accidental. Note that after each act of creation God declared His physical creation "good," and after the creation of man and woman "in His image" (apparently referring to such aspects as reflection, communication, relationship, creativity, and moral sense), He pronounced it "very good." (Gen.1)

The Christian metaphysic begins with the ex nihilo creation of the entire physical universe by the spoken desire of God.20 This does not mean matter alone, but all aspects of the physical realm- matter, energy, time and space. This creation exists for the expression of God's power and glory. Furthermore, God initiated and sustains all nature. God created men and women as an expression of his glory, yet distinct from the rest of creation; man alone bears the image of God. [1]

God specifically made all things and continually sustains all things. We are told in Colossians that all things exist for Him. (Col. 1:15-17) This is the ultimate foundation of our profession. Not only do we practice engineering to the benefit of mankind, but first, consciously and deliberately, to the glory of God.

When God made people, he made them from the stuff of the earth, from the dust of the ground. Humans are inseparably linked to creation, not just because they are created beings along with the rest of creation, but because they were fashioned out of the very earth itself. [Again, notice that not even humans were made from the stuff of God, but the stuff of earth. Even humans don't have inherent value, but rather their value comes from God who said they

were "good."] [2]

Creation is also linked to the notion of "common grace," God's goodness available to all people regardless of their relationship to Him. This is seen in (1) the presence of the sun, moon, and stars as a declaration of God's creation (Ps. 19), (2) the sun, rain, and soil provided to all for growing food, and (3) the human ability to make tools to work with nature.

As generally used, "common grace" describes the regularity of the operation of natural processes on earth and their general applicability to all mankind at all times. The products of the engineering profession - the built-environment, the infrastructure of power, water, communications, transportation, etc - the regularity and reliability of which is essential to our individual and collective functioning in modern society, share some similar characteristics with "common grace" natural phenomena as weather, seasons, time and tides. [3]

We might say that it is common grace that makes engineering possible in all cultures.

The similarity of engineering practice between Christian engineers and engineering engineers of other faiths is not due to a fundamental independence or mutual irrelevance between and Christian faith, but rather is due to the nature of engineering as a common grace activity. Gidley writes "Good engineering makes real provision against real evils, bringing by God.s common grace longer life, ease of toil, and pleasurable recreation."4 To call engineering a common grace activity is to say that it is a gift of God, given both to those who do receive and to those who do not receive special grace. Both groups receive the same gift from the same Giver, so no substantial difference in the operation of the gift is expected. [4]

Fall (Gen.3)

By a deliberate act of disobedience, the first human pair committed the first sin against God, resulting in ongoing consequences - broken fellowship with God, physical death, and changes in the earth that made the work of growing toilsome. The fall and its results affected the human soul, spirit, and body, and are best seen as broken relations, as humans became separated from God, from others, and from the earth.

Were laws of physics actually altered by the fall, as some Christian writers have suggested? The idea is strictly conjecture, and not supported by scripture. The atom, the stars, and planets apparently have not changed since creation. If friction for walking, respiration effects, and star combustion existed from the beginning, then the second law of thermodynamics did not begin at the fall.

Redemption (Rom. 3:23-25)

By His death and resurrection Jesus Christ paid the penalty for each person's sin and made reconciliation with God possible by faith in Him.

Christ's death on the cross was complete and accomplished all that God intended, initiating the undoing of all that occurred at the Fall.

Redemption implies a buying back, a recovery of what was taken. Jesus accomplished our redemption on the cross. This was promised long before (Ps. 22, Isa. 53). When Christ died as our Substitute He

- Paid for sins
- Purchased a people for His name, and
- Destroyed the works of the devil

For the Christian believer this aspect of God's revelation is the key to all of God's actions in history and all of our life. At a given moment in time (c. 30 AD) the holy and perfect Son of God suffered and died on a cross outside of Jerusalem as a substitution for human sin. (Isa. 53, Mt. 27, John 19) The message for the world is that anyone who places their trust in Christ is fully forgiven and brought into a vital relationship with God-forgiven, rescued, cleansed, restored, justified, made alive, born anew. (John 3:16)

Redemption was effected by God, when His Son, Jesus the Christ, paid the penalty for man's unrighteous actions. This redemption has a two-fold effect on humankind. First, it transforms the individual human heart16 moving it from a state of self-centered corruption (fall) to a state in which God renews the heart and mind in truth. In this renewed state, man becomes a true worshiper of God and understands that the universe is an expression of the creative nature and will of God. In his redeemed state, man spiritually returns to the original tasks of worshiping the One True God and "keeping and tilling the garden. [5]

Secondly, for the redeemed, the source of this redemption, Jesus the Christ, now is the inspiration for a renewal and redemption of human culture from a positive and constructive position.11 From the Pauline perspective, redemption was not just limited to humankind but was much more comprehensive, reaching to all of creation. In fact, what God has accomplished through the work and personhood of the Redeemer is fully eschatological in nature." *[6]*

Restoration (Acts 3:21, Rev. 21)

The Bible indicates that Christ redeemed fallen humans, yet the scope of His action extends to all of creation (Col. 1:19-20, Rom. 8:19-21, Eph. 1:10). In the current era of divine history, individuals are being brought into God's Kingdom. Simultaneously, God's justice and peace are spread through the world. All that was separated can be reconciled and restored.

Abraham Kuyper, Dutch statesman and theologian, expressed in a famous quote the powerful idea that Jesus Christ has purchased back all of the world for Himself: "There is not one square inch in the entire domain of our human existence over which Christ, who is Sovereign over all, does not cry, 'Mine!'"

Implications for Engineering

Science is primarily focused on understanding God's Creation. Creation makes engineering possible, and the Fall makes parts of engineering necessary.

The Bible begins with the creation of all things and ends with the renewal of all things, and in between it offers an interpretation of the meaning of all history. In The New Testament and the People of God, N.T. Wright says that the divine drama told in Scripture "offers a story which is the story of the whole world. It is public truth." It is the only story that explains the way things were (Creation), the way things are (Fall), the way things could be (Redemption) and the way things will be (Restoration). The biblical metanarrative makes a comprehensive claim on all humanity, calling each one of us to find our place in his story. [7]

Grand Theme #2 – The Glory of God

God's purpose on the earth is that all people should know His greatness and worship Him. The Westminster Catechism expressed it in these familiar words: "The chief end of man is to glorify God and to enjoy Him forever." (John Piper has rephrased this as "The chief end of man is to glorify God by enjoying Him forever.") What does it mean to glorify God? Clearly we can't add to His all-surpassing glory, but we can help others to see His grandeur.

Literally, the word "glory" in the Old Testament meant "weight." God's glory in the scripture was related to a the attributes of God made visible to humans, usually as a brilliant shining light, showing the inherent splendor of God, His infinite beauty and grandeur, a manifestation of His holiness. Only a handful of people ever saw God's glory, but those who did were changed forever. (Isaiah 6)

God Himself is the only "King of Glory." (Ps. 24:8)
God created, called, and rescued Israel for His glory. (Isa 49:6-7, Jer. 13:11)
The glory of God filled the completed tabernacle. (Ex. 40:35)
Christ is the brightness of God's glory. (Heb. 1:3)
Jesus glorified the Father, by His life, and by His death. (John 12:19, 28)

How can we glorify God?-

- Offering praise to Him (Ps. 50:23, Ps. 29:2)
- Acknowledging His provision with thanksgiving and worship (Ps. 100:4-5)
- "Magnifying" the Lord (Ps. 34:3)- showing others how "large" and how great God is
- Doing our daily tasks (all of them) specifically for the Lord (I Cor. 10:31)
- Praying in Jesus' name (John 14:13)
- Producing spiritual "fruit" (John 15:8)
- Receiving God's promises by faith (2 Cor. 13:18-20)
- Using our gifts to serve by God's strength (1 Pet. 4:11)
- "Letting our light shine" by good works for others (Mt. 5:16)

People may judge the nature of God by what His people do. It does not glorify God, said Alistair Begg, if we are disorderly slobs, if we are habitually late and make others wait for us, or if we are insensitive to the needs of others, since God is orderly, timely, and concerned about every one of us. [8]

Grand Theme #3 – The Kingdom of God

A major theme in the New Testament is that Jesus inaugurated a new Kingdom for all who

follow Him, a Kingdom where God reigns in the midst of our world. God is the rightful owner of everything in the universe. While sun, moon, stars, and all of nature obey Him, we humans continually rebel.

- Jesus came announcing the Kingdom of God. (Mk. 1:15)
- No one can enter the kingdom unless they are born a second time. (John 3:3)
- We are told to "seek first the Kingdom of God." (Mt. 6:33)
- We are instructed that "The kingdom of God is not meat and drink, but righteousness, peace, and joy in the Holy Spirit." (Rom. 14:17)
- Jesus' kingdom is "not of this world." (John 18:36)
- Believers are transferred "out of the kingdom of darkness and into the Kingdom of God's dear Son." (Col. 1:13)
- "The Lord will be king over all the earth." (Zech. 14:9)

Therefore we conclude that

- The Kingdom of God exists where Jesus is King.
- The Kingdom of God exists wherever God's rule is acknowledged (and submitted to.)
- The Kingdom of God includes the forgiveness of sins and new allegiance, demonstrating God's power and love on the earth, and meeting the needs of the neediest.

Grand Theme #4 – Human Flourishing

"Shalom" is the most common greeting in Hebrew, usually translated as "peace." Shalom, however, has broader meaning which includes well-being, health, prosperity, abundant living, thriving, and "human flourishing." The picture in Scripture is not simply that we live but that we flourish. The world of Eden would be considered an environment of perfect shalom.

The Hebrew prophets used a word to describe the anticipated renewal of the creation that can rightfully be employed here to describe the original creation: shalom. This word is often translated simply as "peace," but it means much more than simply the absence of hostility. Shalom describes the creation as it was meant to be, a life of flourishing and prospering in which our relationships with God, with each other, and with the nonhuman creation are luxuriant and thriving. A world of shalom is characterized by justice, love, thankfulness, and joy. [9]

Psychologist Abraham Maslow described a hierarchy of human needs which builds from mere survival up to "self-actualization."

Self-actualization	Achieving full potential, creativity
Esteem	Confidence, respect, accomplishments
Social	Love, belonging; family, friends

Safety	Security, resources, health
Physiological	Survival: food, clothing, shelter

While Maslow provides some useful insights, it is obvious to a Christian that Maslow's scheme does not include God. Some may want to put God at the top of the pyramid, but, in fact, our need for God is present at every possible level of existence. It is important to note that shalom is primarily a gift from God. It is not utopianism, nor can it be brought about by mere human effort.

God's blessings don't stop with believers. God blesses His people to be a blessing to the whole world.

What could flourishing entail?

1. Right relationships- with God, self, others, and the rest of creation
2. Not living in fear or struggling for survival. Instead, having abundance and sharing from that abundance.
3. A sense of worth, value, and accomplishment, including feeling useful at work
4. Peace itself- absence of war and interpersonal conflict
5. Freedom- not enslaved at all
6. Harmony and cooperation in community
7. Health and safety
8. The ability to advance
9. Making a difference in the world
10. "The good life" - In the American model the good life includes material abundance, luxury, pleasure, and pursuing one's own dreams. These, however, are not what God calls us to. [10]

For the believer we would include these aspects:

1. Loving the Lord with our heart, soul, mind, and strength and loving our neighbor as our self.
2. The connection of shalom to "blessed," "happy, and God's pleasure (Sermon on the Mount)
3. "Good news to the poor, release to the captive, sight to the blind, freedom for the oppressed." (Luke 4:18)
4. An Old Testament Biblical picture of flourishing: Every man living "under his own vine and fig tree." (Micah 4:4, Zech. 3:10)
5. Living fully what it means to be created in God's image.

All of these are tied to Christ Himself and the life He makes possible.

How can we encourage and establish shalom?

- Seek first the Kingdom of God, by prayer and by action
- Rescue, protect, restore, and preserve
- Point to Jesus who bore our sin
- Do what is right
- Go "the second mile" to help
- Confess, repent, restore
- Deliberately take actions to better people's lives
- Work to restore relationships
- Establish justice
- Meet the needs of orphans, widows, and the poor
- Work to end suffering, pain, and exploitation
- Partner with God to redeem, forgive, and restore
- Reach out to the marginalized

Rice describes Christian flourishing this way:

Christian human flourishing is not self-centered but is God-centered. We do not define our value as human beings by the degrees of our personal happiness.

Christian human flourishing is not merely spiritual. God's human flourishing begins in our present lives. It embraces every aspect of our persons—physical, emotional, intellectual, and spiritual…

Christian human flourishing is not dependent on a person's, a community's, or a nation's financial prosperity. Christian human flourishing, like Shalom, is not a message of exclusively financial wealth; it is a message of holistic well-being.

Christian human flourishing does not devolve… Christian human flourishing does not romanticize any type of poverty or voluntary aestheticism as a spiritually superior position or as the primary means to greater spirituality. [11]

Sin and Shalom

Why aren't we experiencing this flourishing at all times and places? The enemy of shalom is sin.

God is, after all, not arbitrarily offended. God hates sin not just because it violates his law bur, more substantively, because it violates shalom, because it breaks the peace, because it interferes with the way things are supposed to be. (Indeed, that is why God has laws against a good deal of sin.) God is for shalom and therefore against sin. In fact, we may safely describe evil as any spoiling of shalom, whether physically (e.g., by disease), morally, spiritually, or otherwise… Moral and spiritual evil are agential evil – that is, evil that, roughly speaking, only persons can do or have. Agential evil thus comprises evil acts and dispositions. Sin, then, is any agential evil for which some person (or group of persons) is to blame. In short, sin is culpable shalom-breaking. [12]

IDOLATRY

A huge danger for all believers is that any good thing may become an idol. An idol is anything that takes the rightful place of God in our devotion, our worship, our identity, or our dependence.

Even though we may be strongly aware of major temptations as believers committed to Christ we will always face temptations and must struggle against idolatry in various forms.

- "You shall have no other gods before me." (Exodus 20)
- "Little children, keep yourselves from idols." (I John 5:21)

If we think of an idol only as a little pagan statue we'll miss the warning. An idol, writes Tim Keller, is anything you rely on instead of God. [13] Idolatry means "imaging and twisting anything to deliver the control, security, significance, satisfaction, and beauty that only the real God can give." [14]

"Idols may be good things that we turn into ultimate things." [15] Anything in life can become an idol if we value it too much, if we gain meaning and worth from it, if we primarily depend on it, if we begin to worship it, or if we sacrifice out time and finances for it.

Common idols in our culture include power, control, comfort, success, security, and approval. [16] Idols common to the church include experience (What have I personally experienced?), doctrinalism (We have it all down right, and everyone else is wrong and not pleasing to God), and consumerism (What benefits am I getting out of this church?).[17]

Other common idols that we may be blind to would be idols of: Dependence, independence, career, achievement, materialism, religion, irreligion, racial and cultural, family, relationship, image, and ideology. As we examine various aspects of engineering we'll discover how easy it is to slip into idolatry in such areas as work, science, education, and technology.

Idolatry is thus the illegitimate alternative to the genuine human task to image God. It is equivalent to living a life so distorted by false worship that it ceases to reflect God's standards.

Idolatry, then, has two distinct, though related, qualities. It involves not only false worship but, by extension, false imaging. Both are warned against in the Ten Commandments. Hear what God says in Exodus 20: 3-5:

"You shall have no other gods before me. You shall not make yourself and [image] in the form of anything in heaven above or on the earth beneath or in the waters below. You shall not bow down to them or worship them." [18]

We need to

- Be aware of the subtle nature of idolatry
- Recognize idolatry in our culture but mostly in our lives

Our response to idolatry must not be to strengthen ourselves to fight it but to confess it and to depend totally on the Lord. [19]

Christianity and Significance

People crave significance. For some, this is achieved by developing a large following on Facebook. For others, there is a need to help others in a meaningful way. Christianity is tied to incredible significance. The believer is known and loved by the Creator of the universe. The decision to receive His forgiveness determines where he or she will spend eternity. The prayers of a believer can affect the future of other persons and can shape the course of history. The words and actions of a believer can influence whether others will relate to Christ and, consequently, where others will spend eternity.

Historic Biblical Thinking and Living

There are a few foundational truths that separate Biblical Christianity from all other beliefs:

- Salvation is essential: God's rescue of us from our sins.
- The God who made us is absolutely holy.
- Christ's death paid the full penalty for sin.
- Salvation is all of grace-no work of ours can save us.

Although there are principles and directions, we must keep in mind that Christianity is absolutely supernatural.

- God is spirit.
- Salvation is supernatural.
- God answers prayer (although not always as we expect).
- The Holy Spirit guides believers.
- Spiritual warfare exists.

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CHAPTER 5: CHRISTIAN LIVING

INTRODUCTION

Now that we've looked at the basic facts of Christianity, we're ready to focus on some key aspects of Christian growth. Most growth ("discipleship") programs emphasize five areas: (1) Bible study, (2) prayer, (3) worship, (4) fellowship, and (5) evangelism.

Growth is essential and part of healthy development. "When I was a child I spoke like a child, I thought like a child, and I reasoned like a child, but when I became a man, I put the childish ways behind." (I Cor. 13:11). There's a time to be a child, and a time to grow up. "I remember my pearl-handles Gene Autry gun with fondness," says Bob Mumford, "But I would look silly wearing it today." [1]

GOALS

Is it wrong to have goals?

Scripture talks about the danger of "selfish ambition." (Phil. 2:3) It's very easy to "go for the gold" in life and to miss what God would have us do. Does that mean we're better off not having goals? Clearly not. If we're to accomplish anything in life we have to have some goals. They just need to be good goals.

Getting rich and having power over others-these don't fit with Biblical goals. Since God promises to give us wisdom when we ask (James 1:5), our starting point should be to pray about our life's direction and goals.

Good goals:

-
- Reading a chapter in the Bible every day
- Praying every morning
- Getting involved in a local fellowship
- Learning subjects well and getting good grades (student life)
- Graduating on time (student life)
- Staying healthy
- Living within a budget and staying out of debt
- Performing well on the job
- Loving family
- Sharing Christ regularly

- Fitting into God's kingdom plan
- Knowing Christ better and better
- Becoming more like Christ

In general, there are four worthy goals for our Christian life: (1) Keeping from sin, (2) Growing in love, (3) Standing for truth, and (4) Glorifying God. Scripture tells us that God has given us "everything necessary for living a godly life." (2 Pet. 1:3).

THE BIBLE & CHRISTIAN GROWTH (BY BILL)

Reading the Bible is an essential part of getting to know God, to know His heart and His desires for us. Reading the Bible consistently, at least some verses very day, is more valuable than reading a huge amount at one sitting once a week.

Suggestions:

Read the verses in context. Don't resort to random finger-pointing of verses for guidance. Don't be like the guy I heard of who was looking for guidance and flipped open his Bible and plunked his finger down on a verse -Mt.27:5. "Judas went and hanged himself." He tried it again -Lk. 10:37. "Go thou and do likewise." Upset now, he tried one more time -John 13:27. "What thou doest, do quickly."

Learn to read between the lines. What does God really like? What did He allow people to do that wasn't really His ideal for them? When was a soldier lying to the king?

Learn some major themes in the Bible. I recommend color-coding a Bible as you discover verses about specific themes, like - God's Word, Who Jesus is, sin, salvation, the Holy Spirit, grace, prayer, and finances, just to name a few. I once used a crayon to color-code a Bible. It helped me find verses, learn doctrine, and I also wound up with a waterproof Bible.

Some themes to color-code:

- Deity of Christ
- Salvation
- Holy Spirit
- Sacrifice
- Promises to believers
- Instructions to believers
- Sin
- Grace
- Prayer

Note that not every action recorded in the Bible is pleasing to God. In many cases the Bible simply reports what happened. Certainly, the actions of Jacob's sons, particularly the murder of the men of Shechem, was not God's direction. In such cases we need to read the whole story to see how it ends and read between the lines to see if God was pleased.

We want to learn what God likes and how God does things.

In the Bible we pick up these ideas-

- God sometimes stacks the deck against Himself and still wins. (Gideon's army)
- God will use earthly weak things to confound the strong. (David and Goliath)
- God sometimes waits until the last possible minute (so that there's no way out) and then delivers His people. (Israel at the Red Sea)
- God tells us important things at least twice.
- God can bring good out of rotten situations. (Joseph sold into Egypt)
- God uses best those who serve Him wholly, but God will use what He's got. (Samson)

THE BIBLE AND THEOLOGY (BY PAUL)

Knowing that evangelical Christianity emphasizes the "priesthood of the believer," including the ability of each Christian to read and interpret Scripture, how do we avoid what some have termed "hermeneutical free-fall," the danger that there may be as many interpretations of Scripture as there are believers (including some really whacky ideas)? Fortunately, we have some principles:

"No prophecy of Scripture is of any private interpretation." (2 Pet.1:20) The context is that no inspired prophet spoke their personal ideas, but rather what God moved them to speak. Similarly, we can't put our personal ideas into the reading of Scripture. Each Scripture has one primary meaning; the actual events that took place, the actual telling the original audience, and the actual commands that were given.

There is no secret or mystical interpretation of Scripture. The core beliefs of Christians throughout the centuries have been held in agreement; for example, the Apostle's Creed. Secondary issues (baptism, church structure, church calendar) are less clear in Scripture but also of less importance. Guidelines exist for interpreting scripture. The grammatical form and historical context are critical.

Key ideas in the Bible are repeated: "Out of the mouths of two or three witnesses let everything be established." (2 Cor. 13:1)

Mumford (ref 2) wrote that every concept in Scripture needs a place in our theology, not the place and not no place, but a place where it fits. Only the Lord Himself and Christ's death for our sins deserves the central place.

Particularly in small-group Bible studies we must avoid the commonly used question, "What does this verse mean to you?" Instead, we should focus on "What does this verse say?" A later question is then, "How might we apply this verse?"

Using the Scripture

- Get the big picture.

Read it for doctrinal truth, instruction, and inspiration.

- Read it in context. Understand each book's author, the time frame, and the original audience.
- Let the New Testament interpret the Old Testament.
- Let Christ's death, resurrection, and reign be keys to interpreting everything.
- Memorize verses so that the Holy Spirit can pull them into your conscious mind when you need it.
- Build it into your mind and nervous system.

PRAYER

Prayer is talking with God, an incredible privilege for believers. It is more than just asking for things and may (should) include praise, thanksgiving, and confession. We are told to

- Ask in faith (Mt. 21:22, James 1:6)
- Ask persistently (Col. 4:2, Lk. 18:1-8)
- Ask in Jesus' name (for His glory) (Jn. 14: 13-14)
- Ask in accordance with God's will/plan (1 John 5:14)
- Some things are always God's will:
- Your sanctification (I Thess. 4:3)
- Giving thanks in all things (I Thess. 5:18)
- That no one perish but all come to repentance (I Tim. 2:3-4, 2 Pet. 3:9)
- Doing good and silencing scoffers (I Pet. 2:15)
- Being filled with the Spirit, praising God and giving thanks (Eph. 5:17-20)

A Practical Guide to Prayer [3] (By Bill)

Some time ago I realized that effective people of God are people of prayer. It became evident when the spiritual activity around our house got pretty high: I would be up late talking to people about philosophy and the Bible, sharing personal experiences, and discussing spiritual matters in general. Since I had to go to school the next day, I would get up later than usual, and cut down on my quiet time, thinking "I've been busy at the Lord's work, so he understands that I don't have as much time as usual." My spiritual life began to collapse, and in general all things around the house, spiritual and otherwise, began to fall apart.

Finally, I grasped the principle that when you have more work to do, you must increase your quiet time proportionally." For example, suppose you occasionally make a trip that takes two tanks of gas. If you wanted to make the trip in a shorter time than usual, you wouldn't quit stopping for gas to save time. To cut down your spiritual input in times of spiritual activity is not a time-saver.

I tried to implement this principle (it was hard at first—there's a real devil who tries to discourage you from a new venture like this), and found, to my surprise, that prayer could be substituted for sleep (up to a point). I was more rested with less sleep and more prayer than I was the other way around.Things began to come together spiritually at our house and in my own life.

I decided at this point to make a project of studying prayer; I realized that people of God are people of prayer. Just about everyone I could think of—Abraham, Moses, Elijah, Paul, Moody, Finney, Wilkerson, Schaeffer…and even Jesus—Prayed.

To begin my study, I went through the whole Bible so I could pick up the context and absorb the contents slowly. I went through the New Testament first, then the Old, and color-coded (with crayon) all the references to prayer. Then, when I was done, (it took months) I flipped through my color-coded Bible and read all about prayer. Several things—the answers to a lot of my questions—flew out at me.

Jesus had people trying to talk with him all the time, but never let circumstances rule his prayer life. He would go off and leave crowds of people to pray. After he multiplied the bread, he disappeared, and his disciples went off and left him. He didn't say "'scuse me, Lord, but I've got a catch a boat. I'll finish praying later." Prayer came first. God intervened to work out little problems (like getting across the lake) as Jesus tended to first things first. It's the principle of Matthew 6:33: "Seek first the kingdom of God, and all the details will fall into place later" (a free paraphrase).

Time, especially to a college student, is just about the most precious thing there is. I became aware of God's norms in this area when the episode of the garden of Gethsemane came into focus.

Jesus walked out with eleven disciples and set most of them on guard someplace. Then he went on to his prayer spot with three more and told them to wait and pray while he went a little further. He prayed awhile, and then returned to find them asleep. He woke them and commented, "Couldn't you stay awake and pray with me for just one hour?"

> "One hour! Just one hour! But I'm very busy. I'm a college student."
>
> Well, was Jesus busy?Was his work important?
>
> "Sure, but that's different. He was doing spiritual-type work, and I'm doing secular-type work."

But God cares about your secular work. If he doesn't, maybe you shouldn't be doing it. If we put our time with God first, he'll help us use the rest of our time more efficiently.

Jesus considered an hour of prayer to be a basic minimum—the least he could do. Take a poll of yourself to start with. How much official prayer do you log in one day?By "official", I mean down-on-your-knees, or sitting-down, or standing-up prayer; not lying-in-bed, or walking-to-class, or driving-to-work prayer. There is a big difference in concentration and prayer efficiency.Also, don't count time in prayer meetings with other people present. I'm talking about prayer alone—you and God only.

Now that it's whittled down to this type, which I call "official prayer", I think few people spend more than ten minutes a day.At this point, a new problem usually appears: it's no longer a matter of "not enough time," but, "what is there to say?" Can you think of an hour's worth of things to say to God? Can you even think of ten minutes' worth?

My main problem was that I didn't know God well. If you know somebody well, and he has things in common with you, you will spend a long time talking with him, and enjoy it. We usually talk at God, but it's supposed to be a two-way conversation. The best way to learn the voice of God is to talk with him a lot. To learn to do it, you do it.

Suppose I decide to spend an hour talking with God.I find a quiet place, alone, and have a Bible, pen, and 3x5 or IBM card to take notes on.

I've found two reasons for taking notes: (1) I get my most fruitful ideas during this time, and am reminded of things to do, which help me all through the rest of the day (2) If I remember something I should do, and don't write it down, I'll keep trying to remember not to forget it when I'm done with my quiet time, so I have a hard time concentrating on prayer.

Content

What should we pray for, specifically? There are two categories: things and people.
It's good that Jesus told us to pray for our daily bread, because otherwise we would probably feel like we shouldn't bother God with such trivia. He purposely told us to ask for personal, tangible things: "ask and ye shall receive, that your joy might be full," "your Heavenly Father will give good gifts to those who ask him," and you can find other examples.

Without this direction, we would easily get off on the tangent of praying pious-sounding prayers for nebulous, intangible things, and we could never verify the fact that we got answers-such things as "bless Sam," "save the world," and "alleviate all suffering." This is "putting a parachute in your prayers." If they're not answered, you'll never know it, so you never have to worry about your prayers not being answered. On the other hand, you can't tell if they ever are answered, so you miss the faith-building experience of specific answered prayer.

Couldn't you go wrong in the other direction, though? Wouldn't that be a bit selfish?

It would. But there's a check included in the system. If it gets selfish, it doesn't work. You get feedback from God, that is, two-way communication. James says the reason we don't get the things we ask for is that we ask in order to satisfy our own lusts. We're supposed to ask in "Jesus' name," and there are some things you simply can't ask in Jesus' name for an opportunity to cheat on a test? That's obvious, but you can think of less obvious examples.

To have a lot of unanswered requests lying around degrades our faith; but if we pursue them until they're answered, they build our faith. We can't interact with God on a personal level without getting personally involved. If we want the significance of an answered prayer, we must take the responsibility of pursuing the prayer to the end. God may probe and unsettle us with such questions as "Why do you want that," or, "What will you do with it once you've got it?" or even, "Ask for something bigger!"

People

As was mentioned before, there are things and there are people; two very different categories to pray for. People, however, are obviously more important than things, because

they have eternal value.Again, look at the account of Jesus in the garden of Gethsemane. He dropped off his disciples and went on to pray for about an hour, and then came back to wake up Peter and the gang. What had he said for that hour? Was it just, “Take this cup from me if it be thy will”?

He did say that, but if he spent an hour saying, “take this cup take this cup…,” it wouldn’t have fit with his own teaching about vain repetition. He must have been saying some other things as well. Other things are given in John 17. There, he prayed about mission and his disciples, and for those who will believe in him on account of the disciples’ testimony.Furthermore, it doesn’t take an hour to read John 17, which means there was a lot more said. We know he prayed for individuals specifically, because he told Peter he’d prayed for him, earlier that same night.

Another example was when Jesus stayed up all night praying, and the next day chose his twelve apostles. How would we have done it? “I've got a big decision to make tomorrow-better get lots of sleep tonight." I get a mental picture of him, there all night, lifting each of his followers up to God in prayer: "What about Joe? Sam? Peter?He's such a klutz-foot in mouth disease---but you know best ... "

Finally flip through the colored Bible and look at the beginnings and endings of Paul’s letters:

> “I pray always for you.”
> “Pray without ceasing.”
> “I make mention of you always in my prayers.”
> “I never cease making mention of you in my prayers.”

The conclusion is that Jesus and his disciples prayed specifically for people, and they felt an obligation to. Paul knew their names (look at the ends of his letters), and said he prayed for them constantly. Consider all the cities he’d been to, and then guess at how many people in each town he must have had personal contact with.

Notice, also, that Paul prayed for Christians. Many people today seem to think that it's more important to pray for non-Christians than for their Christian brothers and sisters; and at first glance it does seem more important that an unbeliever should receive Christ and have eternal life than that our Christian brothers and sisters should be lifted up.

But the Bible teaches that we have a greater responsibility to pray for Christin than for non-Christians.

Love's Reality

The most effective means of evangelism is love.A non-Christian is supposed to be able to look at the Christian community and see such love among them that he sees reality and wants in. Jesus said that this is the way all men are to know we're his disciples, by our love for one another. If we really love one another, we should at least pray for one another.

A second reason for especially praying for believers is that when a believer falls into sin, numerous non-believers (his immediate circle of friends and relatives) see it and count it as one more vote against turning their own lives over to Christ. On the other hand, if he excels in

his spiritual life, they are persuaded in the other direction. Thus, prayers for one Christian affect several non-Christians.

We ought to have priorities in prayer. Especially pray for believers and for those with whom you have had close spiritual contact. Take spiritual responsibility for these people and be faithful. Don't quit praying for someone just because you haven't seen him for a while.

One of the biggest problems is vain repetition, prayer for people becoming an impersonal recitation or names.

One of the first things that occurred to me after deciding to pray for people was whether I should pray a lot for a few people, or a little for many people. The number of people I've been associated with in my life overwhelms me. If I was to mention each one every day, there would probably only be time enough to recite a list of names.

On the other hand, maybe the answer is to pray intensely for a few people. The problem is that fairly soon you're out of things to say. Prayer degenerates to daydreams. You can only pray just so intensely. Knitting your eyebrows, wrinkling your nose, and gritting your teeth doesn't help much.

If you switch to someone else, though, there is more to say, because each person has different needs, if we deal with him personally.

The solution to keeping prayer time efficient is to pray for a person until he's "covered," and then go to the next one. Don't make the mistake of thinking that the more time you've put in on a person, the better you've prayed for him. Furthermore, establish priorities. When you make up a prayer list, pick only a few people, of high priority, to pray for, and decide to be faithful to them. You might want to consider these categories:

1. Yourself
2. Your immediate family
3. Prayer partners and spiritual elders
4. People you've helped to know Christ
5. Close Christian friends
6. Relatives
7. People you've witnessed to (to keep the seeds watered)
8. Old friends and neighbors
9. Government leaders

Don't bite off more than you can chew for your top priorities, or you'll just get discouraged. Beware of imperialism: "Since you're no longer interested in God, I'm no longer interested in you." When we decide to pray for someone, it should be a permanent responsibility. Choose carefully. Don't just agree, offhand, to pray for someone regularly.

Should a prayer list be written down or memorized? There are pros and cons either way. One trouble with memorizing is that it takes a lot of time; however, if you start with a few and build up your list slowly and carefully, it won't be a sudden large expenditure of time. Another problem is that it's easy to lose track of where you are in a memorized list and to go off into daydreams.

On the other hand, it can easily become impersonal and repetitious. You've probably had the experience of having read a paragraph mechanically and suddenly realizing that you have no idea what you've just read. If we do this with a written list of people, we might just as well record the list on tape and turn the tape recorder on each day.

Another problem with a written list is that it's hard to make it impromptu. To pray, you must drag out your list and go over it. Paul mentions in some of his letters that he prays for those people always, "without ceasing." It seems that the must have had them stored in his head, praying about them as he walked between towns or mended tents. As our mental prayer list grows, we become more familiar with the people we pray for, turning them over in our minds and probing their needs, as we seek things to pray for them.

It's helpful to arrange people in cities, or along a path, or in the rooms of a house (mentally), and then walk around in your mind to the different places and pray for the people you find there. To Pittsburgh to pray for John and Kathy and Dave and Connie. To West Chester for Fay and Lee, etc.

I'm still amid my prayer adventure, but a lot of things in my life have changed since I started. I can remember previously running back and forth from one brother or sister to another, praying for them and trying to help them get straightened out of some crisis they were in---concentrating on that person, to the exclusion of others, until he seemed all right. Then someone else (for whom I had not been praying in the meantime) would fail, and I would be off to try to help him, while the first person ran downhill. It was like trying to juggle.

Now since my prayer time has increased, this situation has improved amazingly. I can't possibly hold up these people by my own efforts, so I give them to God.

Also, after I'd started praying for previously forgotten friends, I started hearing from some of them. One called up long distance one night and said he'd just recently run into some Christians and had become re-interested in spiritual matters; he was having Bible studies with them. As more of these incidents came up, it became undeniable that God was answering prayer.

In spite of these things, however, I haven't found the formula for easy prayer. Some of the things I found to be new months ago are already getting to be rote, "old hat," mechanical. I find that I must seek new ways to communicate with God. There is constant tension between the mechanical and personal, similar to that which must operate in marriage to keep the love alive and personal. "I love you," said at the same time each day, with the same tone of voice and expression, becomes mechanical after a while. In the same way, our communication with God becomes mechanical after a while, and we must seek new modes.

There are no formulas for prayer, but I have a few basic guidelines to follow. Here are some of them:

1.Pray in secret (at least some of the time).
2.Avoid vain repetition.
3.Be specific
4.Pray through to an answer (finish up "prayer loops").

5.Don't ask for something too big to start with. Make it believable (ask within your present faith limits).
6.Nothing is too little for God
7.Noting is too big for God.
8.People are important.

If you decide to try investigating prayer, you will probably come to some of the same conclusions I have come to, but you will run across some different discoveries, too. This is what makes it all an adventure: You find things, straight from God, that some others may never have. Since you are a person, God will interact with you in a unique personal way.

When You Should not Pray About It (By Paul)

Several years ago, when our family first moved to Texas a young man; call him Rickey, came to stay with us for a while. We had a spare room in a garage-style building that worked well. It gave some privacy both to him and to the family.

Rickey had recently become a believer and was getting his life together. We were delighted that he quickly found a job in town and was getting into a good routine. After a few weeks we noticed that Rickey was no longer heading to work each morning.

"No, I'm not sick ", he explained. "I'm praying every day about whether I should go to work or stay here all day and study the Bible."

Wow, that really sounded spiritual, but it was really off-course. Rickey had promised to be there at work five days a week, and they were depending on him. How often, I wondered, have I prayed about something when I really shouldn't?

It seems like there was a guy in the Old Testament who did that; a prophet for profit named Balaam. He knew that God really didn't want him to go with the Moabite king to curse Israel, but he kept praying-and God finally let him go. Fortunately, God turned each utterance into a blessing, much to the anger of King Balak, but there's no guarantee of what will transpire once we disobey.

Here's what I concluded:

If you already have your marching orders, don't pray about what to do.
If the Bible is crystal clear on the action to be taken, just do it.
If you've already made a legitimate promise in good faith, don't pray about whether to keep your promise.
Don't pray about whether you should have an affair (N), pay your taxes (Y), tell the truth in court (Y), or show up for work (Y). Do what God wants and pray primarily for the strength to do it.
If you pray about whether to do something when you already know the desired action you open yourself up to deception. Many believers have shipwrecked their lives because they followed their heart and "prayed about it".

Pray Without Ceasing (By Paul)

The Bible tells us to pray without ceasing (I Thess. 5:17). My understanding of this is that we are not ever to stop praying or to give up on praying. We should be praying, not every second, but all throughout the day. These are probably short prayers. For certain, we don't say "Thank you" nearly enough.

Praying for several large categories of people in a single day may not be practical. Many believers focus on one group each day, for example: one day for pastors and elders, one day for missionaries, one day for neighbors, one day for co-workers, one day for relatives, and one day for government leaders.

I'm not sure what to make of believers praying for good parking places every time they drive or praying about what to eat for lunch. Certainly, if something is important enough to get us upset it's important enough to pray about.

WORSHIP

The term "worship" is sometimes applied to all of a Christian's life, and it is rightly said that everything in our life should be an act of worship, and that everything the church does should be considered worship, for everything we do should glorify God. [4]

Results of genuine worship:

- We delight in God. Ps.16:11
- God delights in us. Zeph.3:17
- We draw near to God. Heb.10:22
- God draws near to us. Jas.4:8
- God ministers to us. I Pet. 2:5
- God's enemies flee. 2 Chron. 20:21-22

True Worship (by Bill)

Worship is an action to and for God, ascribing worth to God. It may involve singing, spoken words, and posture. In the Scripture worship involves sacrificing what you love and giving it to God. This can involve

- Your time
- Your money (gold, silver)
- Your possessions (cattle, grain)
- Your pride (bowing down before God)
- Your children (Abraham in Gen. 22)

Worship is saying by your actions and words that God is worth more to you than anything else. Worship does not necessarily feel good. Did Abe trot happily up the hill knowing he was being asked to sacrifice his son?

FELLOWSHIP

The Christian has a special relationship with God and with all other believers. The concept is known as fellowship, and it involves a great deal more than small, talk and eating a potluck together (as much as I enjoy potlucks.) Fellowship (Greek -koinonia) translates as sharing in common, holding in common, partnership, communion together, partaking, unity, and participation. We share each other's joys as well as each other's needs.

We must walk in the light to have true fellowship (1 John 1:6-7).
We need to learn humility and seek unity (Phil. 2:1-2).
We are taught to do the following actions to "one another":

- Love (John 13:34)
- Encourage (I Thess. 5:11)
- Forgive (Col. 3:13)
- Accept (Rom. 15:7)
- Have the same mind with (Rom. 12:6)
- Serve (Gal. 5:13)
- Be devoted to (Rom. 12:10)
- Show hospitality to (James 5:16)
- Bear burdens of (Gal. 6:2)
- Pray for (James 5:16)

In addition to sharing in the blessings and good times, we also share in sufferings (Phil. 3:10).

Why do we Need the Body of Christ? (By Paul)

Throughout the New Testament those who are followers of Christ are in a special category. Believers are known as the Church (Greek *ekklesia*- the assembly, the called-out ones). The Church is described as a building (Eph. 2:19-22, 2 Cor. 5:1, 1 Tim. 3:14-15), a flock of sheep (John 10), a kingdom (Matt. 13), an army (Eph. 6:10-18, 2 Tim. 2:3-4), a family (I Tim.5), a vine (John 15), a bride (2 Cor. 11:2), and a body (I Cor. 12, Rom. 12:5). While we are adopted children of our Heavenly Father, we must not live as "King's Kids," if by that term we suggest living like spoiled brats. While we receive enormous benefits ("blessings"), we are to live lives of loving service.

Rom. 12 and I Cor. 12 portray the Church as the Body of Christ, with Christ as the head and each person as a vital member or organ within the body. We can have no concept of a "Lone Ranger Christian" (Who was that masked man?), since we thoroughly need each other:

- We need the spiritual gifts that others have
- We all have "blind spots," not visible to us
- We all need a reality check
- We need regular encouragement
- We need accountability
- We need to exercise our own gifts
- We need the scriptural insights of others

- We need to keep from false belief/doctrinal error
- We need others to pray for us
- We need to worship together
- We need to encourage others and their ministry

EVANGELISM

Most believers have heard of the classic "four spiritual laws"- [6]

- God loves you and has the optimum plan for your life
- Sin is the barrier between you and God
- Christ died to remove the barrier between you and God
- Make the decision to receive Christ's forgiveness and new life
-

Evangelism is the Gospel (By Bill)

The Gospel message contains two things you need to know and one thing you need to do-

- Know that you're a sinner, and your sins separate you from God.
- Know that Christ died to pay for sins.
- Do respond by trusting Christ as your Savior.

Bill Bright added a buffer on the front: "One -God loves you and has a wonderful plan for your life," and popularized these as "The Four Spiritual Laws." There is an understood "Zeroth Law" prior to the first Law: "There really is a God, perfect and holy."

We might add a fifth law: "Satan exists. Satan hates your guts and has a horrible plan for your life."

One of the greatest deterrents to Biblical evangelism is our American concern for numbers. What is God's attitude toward numbers? Gideon was told to cull out his army; Jesus thinned out His disciples (John 12). God seems more concerned with quality than quantity.

One of the problems associated with being a paid evangelist is that those paying your bills can only see the external results; but it might be that God would have you go to do something that doesn't seem very spiritual, or doesn't yield any spiritual "fruit" , because the result of that thing might be far in the future. The important results of any action are in the heart, not external. God might move you to befriend a non-Christian and concentrate your love on him for many years, so that he might turn to Christ after you have died. On the other hand, you might convince thousands of people to pray a prayer to accept Christ, and it might not "take". If it's done in your own strength and wisdom, it's to no avail.

"Friendship evangelism" should perhaps be replaced by "Family Evangelism", which would call for a deeper involvement and be closer to the relationship Jesus calls us to. We should not merely befriend a non-Christian and try to win him to Christ but realize that we are attempting to adopt that person into our family as a brother, sister, or baby. This implies that we take responsibility for that person's spiritual growth; for the rest of our lives.

Evangelism and the Golden Rule (By Paul)

Sometimes evangelism is likened to making a sale. I'm not especially happy with that analogy or with cold-call salesmen.

Jesus taught us to "Do unto others as you would have them do unto you." (Paraphrase of Matt. 7:12)

Frankly, I don't like

- To be ambushed
- To have a "bait and switch" experience
- To be manipulated emotionally
- To be given a canned sales pitch
- To be someone's statistic or "project"
- To hear exaggerated claims
- To be pressured to respond

On the other hand, I do appreciate

- Genuine help
- Genuine friendships
- Straightforward talk
- Helpful information

I think these principles should guide my sharing of the Gospel.

GUIDANCE

"Guidance" refers to being directed by God for the decisions of life. A large portion of our decisions will arise from the commands and examples of Scripture as well as common sense (eat meals, get sleep, brush your teeth, show up for work). Sometimes we need direction for big decisions.

God's Guidance (By Bill)

Let's look at the difference between faithfulness and foolhardiness before we go any further- define "foolhardiness" as "a determination to do something, thinking that God has called you to do-it but based on no evidence, or on insufficient evidence". The most-asked question in a Christian counsellor's experience is usually "How can I find God's will for my life?" The answer is bound up in the difference between faithfulness and foolhardiness, which is: evidence.

How does God reveal specifics to us? By the Two-Witness-Principle of Scripture (Gen.17:19,18: 10,41:32; Nu.35:30; Deut.17:6,19:15; ISam.2:27,34, 3:11; IIK.2; Isa.7:10-16; Jere.27:20,32:6,8; Matt.18:16; Mk.14:55; Jn.5:31, 8:17; II Cor.13: 1;1Tim.5:19; Heb.6:18); this is not just a little formula I

thought up; note how it threads through the whole of Scripture. God even binds Himself to the principle: He told Ahab to ask for a sign and punished him when he didn't; the history of the kings of Judah is told twice; and Christ's life is recorded four times.

There should be two periods of time in any endeavor, during which you act differently; the first period is seeking - looking for evidence. When you have your evidence, (a leading plus a confirmation), then you go forward in faith, in a determined fashion doing what you have been tasked with, independent of your feelings or circumstances.

For example, suppose you are walking along, and a prophet jumps out from behind a garbage can and proclaims, "God says you should sell all you have and go to Timbuktu". Then he tells you some things that prove to you that his message has a supernatural source, like maybe a secret that nobody knows but you.

How should you react?

Say "Thank you", and "That's one", mentally chalking up a "one" on your mind's blackboard. Then suppose you go home and as you come into your house, you say to your wife, "Honey, the · funniest thing happened to me today..." but before you can finish, she interrupts with "well, you'll never believe what happened to me. An angel appeared to me and said we should sell everything and move to Timbuctoo".

You chalk up a "two" at this point. Now you have your orders. You are no longer in the "seeking" period but can go on in faith to do what God has tasked you with. To go without the confirmation is foolhardiness. I know more than one person who has told me that "God told them" they were going to marry a certain person, and they didn't. But none of those had any confirmation, either.

When God has finally given you sufficient evidence to start moving in a certain direction, it's as if He says, "Got your orders?" And you say, "Yes, Sir!" and salute.

Then He turns to Satan and says, "Okay, you can do what you like, now. He's got his orders. But don't do so and so." Don't worry, God won't let Satan lay more on you than you can take (I Cor. 10:13), even though; amid the trial, it usually seems like it's passed your endurance level. This is because we tend to go easy on ourselves. Remember C.S. Lewis' The Horse and His Boy? Bree (the Horse) was running toward the gate. The boy leaned over and urged him to go faster. Bree indignantly told him that he was going as fast as he possibly could. The pursuing lion roared, and Bree found that he could go faster. God knows better than we do how much we can take, and it's even good for us to be "stretched" in this way; this is, "the trial of our faith that worketh patience" spoken of in James 1:12,and it seems to be standard operating procedure in spiritual endeavors. If you are called by God to do something, then you will face opposition.

Remember Moses: He got his marching orders, and immediately there was the Red Sea in front and the Egyptians behind. But God got him through supernaturally. This is what is meant by I John·5:4 - Christians overcome the world. It means that circumstances don't stop them - they go through the problems, relying on God.

But back to our story. What will happen? Hopefully, our heroes will begin selling all they have in

preparation to go to Timbuktu. Maybe in the next morning's paper, though, they will read a headline: "All passports to Timbuctoo denied", or, "War breaks out in Timbuktu". Or, maybe he'll get the raise or promotion he's been looking forward to for years, the next day. Satan is very creative. But faithfulness, is to go ahead in what God has said, despite the odds. The important thing is that you must know that He said it. The difference between faithfulness and foolhardiness is evidence.

KEEPING FROM SIN

Why it's important to keep from sin

- Sin breaks our fellowship with God (at least temporarily).
- Sin works against the goal of our becoming more like Christ.
- Sin get us into long-term bondage.
- Sin plays into Satan's hand, not God's plan.
- Our sin can turn non-Christians away from the Gospel.
- Sin can make us useless for the Kingdom.
- Actions have consequences-BG conservation of crud
- Deliberate sin opens us up to Satan's devices. (2 Cor. 2:11)

Solution: confess, repent, get back on track.

The following are the consequences of sin. Essentially, sin is destructive; violates the holiness of God.

- Sin separates us from God
- Ultimately destroys us and others
- Destroys God's shalom

There's an old Russia proverb that says, "If you don't get caught, you're not a thief." Sure, you are. According to Jesus, if you even contemplate the sin you're revealed as a sinner. (Mt. 5:28) And if you refrain from the crime for fear of getting caught, you're just a sinner who's chicken.

Sin affects others

Because we are connected to others, part of the suffering is the world is directly or indirectly due to human sin.

- Someone hacks into a bank account and destroys a family's financial future.
- A guy gets drunk and drives his car, killing or seriously injuring an innocent person.
- A woman in a village has an adulterous relationship and passes AIDS to her husband and future children.
- We get jealous of a co-worker's success at work and begin to spread rotten things about their life.
- A man gets into a pornography habit and erodes tenderness and intimacy with his wife.

The conclusion is that we don't sin in isolation. Our actions affect others. We might call this principle "the conservation of crud."

Three Major Categories of Temptation

I John 2:16- "For all that is in the world; the lust of the flesh, the lust of the eyes, and the pride of life; come not from the Father, but from the world." These three temptations seem to hit three different areas of our being and show up in a number of places.

When we look at sin, three major areas arise again and again: pride, lust, and greed. Each affects how we relate to God, to self and others, and to the world.

Greed basically says: I'm not satisfied with what God has given me; I deserve much more; I will use others to get what I want; the world is mine to pillage.

Lust says: My highest good, my highest goal is my own physical pleasure; I will use others for my own pleasure; the world exists for my pleasure.

Pride says: I don't need God ("I am the master of my fate; I am the captain of my soul."); I am better than others and should control others; I control the things of this world.

Following the format of Richard Foster (ref 7) we might sort the temptations this way:

1 John 2 category:	Lust of the eyes	Lust of the flesh	Pride of life
Primarily effects	Soul	Body	Spirit
Classical "7 deadly sins"	Greed	Lust	Pride
General temptations	To have what we see	To satisfy our body	To be in charge and do things "my way"
Can lead to these sins	Coveting, theft	Sexual immorality or physical addictions	Conquest, contempt, injury, or murder
Temptations for Adam & Eve (Gen. 3)	Appealed to the eye	Good to eat	Become as gods
Satan's temptations for Jesus (Mt. 4)	I'll give you all these kingdoms you see	Turn these stones into bread	Throw yourself down from the temple so that angels rescue you
Our fallen thoughts	I want to own it all	I want to physically experience it all	I want to control it all

Wrong values	Material possessions	Physical pleasures	Power
Wrong priorities	Elevate all things above all	Use people as things	Use people as pawns
American values	Money	Sex	Power
Opposing virtues	Contentment or generosity	Self-control, purity	Humility
Monk's vows	Poverty	Celibacy	Obedience or humiliation
Biblical mindset solution	Stewardship - God owns it all	Submission - My body as a living sacrifice (Rom. 12)	Servanthood - My role is to serve others
Spiritual disciplines	Sacrifice - give stuff away	Fasting	Servanthood
Spirit-directed balance	Guided ownership and stewardship	Righteous pleasures, including marriage	Servant leadership and submission

We learn that four "S" words that we struggle with (sacrifice, submission, servanthood, and suffering) all can play a large part in helping us to keep from sin.

John Piper points out that three big modern temptation areas (money, sex, power) are not wrong in themselves: Money can provide for families, support missions, and care for orphans. Sex is right and beautiful within the bounds of marriage, tied to intimacy and the potential of children. A certain level of power is exerted in proper (godly) leadership, which builds up people rather than controlling them.

God did not conceive and create money, sex, and power simply to be a temptation. He had good purposes in mind. Money, sex, and power exist for the great aims of God in human history. They are not detours on the path to God-exalting joy. Along with all the rest of God's good world, they are the path. With them, we can show the supreme worth of God. [8]

HOW TO MESS UP

Ten foolish things Christians do to mess up their lives

1. Go for weeks without praying or reading the Bible.
2. Marry a non-Christian spouse.
3. Get angry with God and deliberately sin.
4. Try to copy the world.
5. Compromise their convictions.
6. Try to serve God in their own strength.
7. Drop out of fellowship.
8. Get offended by someone's comment or conduct.
9. Get into drugs or porn.
10. Get into occult practices.

A catalog of messed up thinking that is known, by experience, to fail:

- I think Christianity is blind faith.
- I think I can say magic words ("I believe in Jesus") and be saved.
- I think I don't need to change (or want to be changed).
- I can sit at the border of God's kingdom and the world and move back and forth. (Mumford called this "Borderline anemia.")
- I can separate all of life into "sacred" and "secular" stuff.
- I think I can serve God on my own strength.
- I can go for days without reading the Bible or praying.
- I think I can escape from the world and not interact with other people.
- I don't need other Christians.
- I think my plans are better than God's.
- I think I've got everything figured out.
- I think we're (my circle of friends) the only ones doing it right.
- The goal of the Christian life is to be rich and happy.
- he focus of the Gospel is me.

CONCLUSIONS

Christian living

- It involves both blessing and testing.
- We can't do it on our own strength and must not try to.
- It involves huge significance.

Our actions influence others. When Christians sin, it's a vote against the truth of Christianity.

Aspects of the abundant life

- Fruit of the Spirit
- Peace with Christ

- Joy of salvation
- Love from God, overflowing to others
- "Living water"
- Ultimate meaning and purpose
- Empowered by God's Spirit
- Resting in Christ

Reflection

Much has been written about the value of reflection or metacognition (thinking about your thinking) in education and engineering. Reflection can also play a part in Christian growth. We are not talking here about a mystical practice or a substitute for prayer and Bible study. It can simply be valuable to stop regularly to think about your actions and thoughts.

- What is my (real) motivation?
- Is this a good (wise and God- honoring) choice?
- What do I need to know?
- Do I have the resources?
- What went wrong?
- How did I react?
- What lesson can I learn from this?
- Am I drawing closer to God?
- What is the Lord trying to teach me?
- What can I learn from that passage or sermon?
- How can I show more love to those closest to me?

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CHAPTER 6: WORLDVIEWS

INTRODUCTION

I enjoy this Peanuts cartoon from the 1960s:

Charlie Brown, Linus, and Lucy are lying on the ground looking at clouds in the sky.

Linus: “That cloud up there looks a little like the profile of Thomas Eakins, the famous painter and sculptor...And that group of clouds over there gives me the impression of the stoning of Stephen. I can see the Apostle Paul standing there to one side.”

"Uh-huh, "says Lucy, "That is very good. What do you see in the clouds, Charlie Brown?"

“Well, I was going to say I saw a ducky and a horsie, But I changed my mind.” [1]

Where do we begin to size up situations?

How do we view our place in the world?

Foundational to our thinking is the idea of “worldview,” our primary concept of the world and how we relate to it. In this sense, every thinking person is doing philosophy. Our worldview will strongly affect how we deal with the physical world and how we approach ethics.

ELEMENTS OF A WORLDVIEW

Every person who thinks about the world tries to make the pieces of their knowledge and experience fit into a pattern. The template that we use for understanding the world is commonly known as our worldview. What are our reference points, our assumptions, and our formal presuppositions? What theory or story explains my existence and the things I experience and observe in the world? “Every person,” wrote Alvin Toffler, “carries in his head a mental picture of the world, a subjective representation of external reality.” [2]

Worldviews often center on the nature of God (or the absence of God). Is there an intelligent first cause (God)? What is this God like? Who am I? Why am I here? What is existence? Does anything exist outside my own mind? What is "reality"? What is life all about? These are all worldview questions.To discuss a person's worldview with him may be a very intimate

conversation. Many people have a well defined worldview without knowing what it is or knowing that they have one. They often cannot understand how a person can have· a worldview differing from their own.

A worldview may be defined formally as:

- A set of philosophical "glasses" through which we see the world
- How one sees life and the world at large; how people make sense of life and the world around them [3]
- A commitment, a foundational orientation of the heart, a set of presuppositions which we hold about all the basic constituents of reality [4]
- A person's interpretation of reality, a basic view of life [5]
- An articulation of the basic beliefs embedded in a shared grand story rooted in a faith commitment and that gives shape and direction to the whole of our individual and corporate lives. [6]

While most people have not thought a great deal about the concept of worldview, many contemporary Christian writers have dealt extensively with the concept. The most detailed study of the concept of worldview is a book entitled *Worldview: The History of a Concept* by philosopher David Naugle. [7]

In *The Universe Next Door*, James Sire suggest that a worldview provides answers to seven basic questions: [8]

1. What is the prime reality- the really real?
2. What is the nature of external reality, that is, the world around us? (Chaotic? Orderly? Matter? Spirit?)
3. What is the nature of a human being? Do we have a purpose?
4. What happens to a person at death?
5. Why is it possible to know anything at all?
6. How do we know what is right and wrong?
7. What is the meaning of human history?

Philosophers suggest that a worldview must address four grand questions:

- Origins -Where did we come from?
- Meaning -Why am I here?
- Morality - How do we know what is right and wrong?
- Destiny -Where am I heading?

Samples [9] indicates that there are six components or foundations in every worldview:

- Theology- concept of God or first cause
- Metaphysics- concept of reality
- Epistemology- theory of knowledge
- Axiology- study of values
- Anthropology- study of human persons
- History- study of past events

BASIC WORLDVIEW CATEGORIES [10]

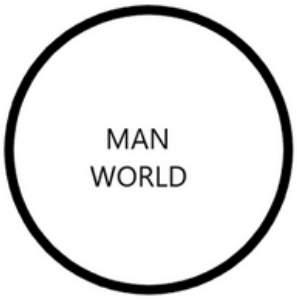
The word "worldview" is used in two senses; one, in the broadest sense, means a person's outlook on life; that is, one's entire philosophical presuppositions about the universe and our place in it. The other, carefully defined term of "Basic Worldview Category" (BWC), describes three primary worldviews upon which all other worldviews depend and which are mutually exclusive by their definitions. These three are fundamental; everyone has only one but may not live consistently with the ramifications or conclusions of that one. Some individuals may claim one or none, but will live out the logical ramifications of one or another of them. A society's culture evolves from one of these three BWCs, and the traditions and idiosyncrasies of that society can be traced to it.

Most of our worldviews will address how God, the world, and mankind fit together. These can be classed into one of three categories: (1) Naturalistic (naturalism), (2) Pantheistic (pantheism), or (3) Theistic (theism). (I am grateful to Darrow Miller, formerly of Food for the Hungry, who first presented this approach with simple figures in the 1980's.)

Each of the three BWCs has, as its basis, a different "theological" statement, that is, a fundamentally different assumption about the nature of the universe. The universe may be (1) all matter, and always has been, so that personality and humanity have to be accidents due to long times and small probabilities; or, (2) a combination of matter and spirit, with the source of the matter being spirit, or, impersonal supernatural but with no concern for humanity.

Naturalism

This is the simplest of all the worldviews. Naturalism holds that everything is made of matter. Period. There is no God, no supernatural. There's nothing special about humans, and no external purpose exists.



NATURALISM

The Pure Naturalistic (materialistic) worldview category consists (only) of matter, with no God included. A typical explanation of beginnings for Naturalism consists of dense material that exploded. This matter, plus time plus chance, must explain all that there is. Carl Sagan's religious statement of faith for Naturalism sums it up: "The Cosmos is all that ever was and all that ever will be." Processes can only develop through evolution, and science is highly emphasized. This worldview is the core of modem humanism, as well as Marxism.

Robert Morey has pointed out seven huge “leaps” that an atheist has to explain: [11]

- Everything ultimately came from nothing
- Order came from chaos
- Harmony came from discord
- Life came from nonlife
- Reason came from irrationality
- Personality came from non-personality
- Morality came from amorality

Pantheism

Pantheism includes a supernatural element, but the supernatural is impersonal. Everything that exists is basically part of God. A religious outworking of pantheism generally includes reincarnation and karma (payback in this life for deeds in a previous life.)

PANTHEISM

The BWC of Pure Pantheism has its outworking in many varied systems, but the essence is as follows: The Pure Pantheist BWC is that in which whatever ultimate reality there is does not care about mankind. There may be a supernatural realm, but the distinction between that realm and the realm of real things is indistinct because we are all part of god. In this system, god did not create the universe outside of himself. However, the material universe is itself god, or part of god.

Pantheism is therefore based on the concept that “all is one," which is the source of the term “Monism." God, man, and the world are indistinct in this system so that everything and everyone is part of it. There is no individual significance because significance is gained by losing one's identity and becoming part of the whole. There is no beginning or end. Everything has always been and always will be, with no categories at all. Neither true science nor true ethics have a consistent base in this system.

The Pantheist system is similar to the Naturalistic system, except with a supernatural realm added. This could be termed "god", but is not the same as the infinite-personal God described in the Theistic system; this god is the system itself--everything and everybody is part of this god, and death could seem relatively unimportant because of the continuity of all things.There is no individual significance because significance is gained by losing one's identity in becoming part of the whole. Individual human life is not ultimately important in a pantheist system

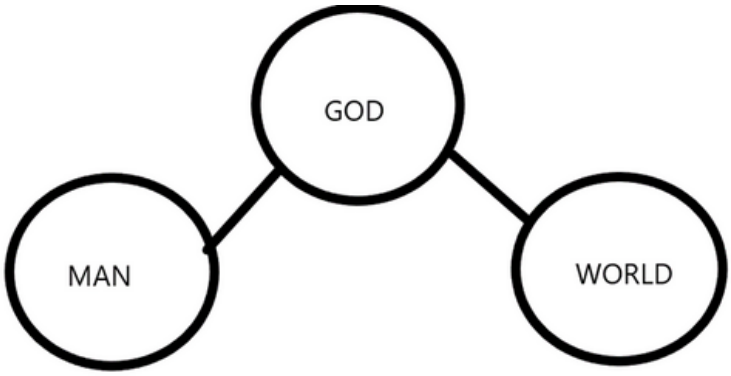
because it is not in a separate category from the rest of the universe. Animal and vegetable life is sometimes deemed more important than human life for this reason. In this system, one can either have morality or logic, but not both. If one is logical, one realizes that he is god, so that whatever he does, or whatever happens, is right. The distinction between reality and illusion becomes blurred since one's thoughts are god's thoughts, so it may be that all that is is simply in one's mind. Societies that adopt this philosophy usually develop a moral system, but to do so is illogical since there is no logical basis for the morality; whatever is done is done by god. The usual theory of beginnings in a pantheist system is that there is no beginning nor end. Everything has always been and always will be.

Os Guinness in *The Dust of Death* notes several features of Eastern religions: [12]

- God and the material world are one and the same.
- The physical universe is an illusion.
- Experience, particularly mystical experience, is stressed. Experience trumps reason.
- Moral guidelines are not part of oneness.
- Individuality becomes a problem, a hindrance to merging with the Absolute.
- "With Christian culture disintegrating and humanism failing to provide an alternative, many are searching the ancient east."

Theism

Theism is the most complex of the basic worldviews. It begins with a personal God who creates and upholds the universe and each human. Humans have the capacity to interact with the world and with God.



THEISM

The Pure Theist's view is that God is both infinite and personal. The term "Infinite-personal God" was coined by Francis A. Schaeffer [13]. The concept that God is "personal" means that He is nearby, or cares personally about what I do. Either God cares what we do, or He does not, in which case we might as well refer to him as an "it" rather than a person; the Deist's "watchmaker-god", which winds up the universe and looks on impassionately as it runs down, is a classic example of an impersonal god. The Deist basically has a naturalistic or pantheistic worldview.

The other part of Schaeffer's term, "infinite", signifies how Godlike the god referred to is. The old system of Greek gods and goddesses was pantheistic since the "gods" were non-infinite and fallible and were themselves created by a higher power. Any polytheistic system will

ultimately reduce to pantheism since the ultimate source of a multiplicity of gods is what should actually be considered the god.By its very nature, polytheism tends to be pantheistic; that is, those gods owe their existence to some "nature of the universe" [14]

The Pure Theistic BWC begins with an infinite-personal God. He is infinite, meaning that He created everything; and, a personal God, meaning that He cares what we do. He creates the universe outside Himself; that is, not as an extension of Himself, but out of nothing. He then creates man, but man is in a different category from the rest of the universe, yet not an extension of God, either. Man is a created being, but with capabilities, both for moral choices and a relationship with God. Man is seen as more than simply material. In this BWC, there is room for both logic and morality, two essentials for an ethical system.

In our society, over the past couple of hundred years, we have seen a drift from a primarily theistic foundation to a naturalistic foundation, which is beginning to move towards a pantheistic system as people seek a form of "spirituality" without accountability to a Creator. For example, from the media, the old Star Trek series was naturalistic/humanistic, while the Star Wars movies have a pantheistic flavor (the Force is the sum of everything, with both a Light side and a Dark side).

Of course, it is possible to "mix and match" -- that is, to hold elements of more than one worldview simultaneously. This is the case in the "West," the community of Western Europe and North America, presently. Although the Naturalistic base will not logically support a morality, in the evolution from the theistic to the naturalistic system, a memory of the Theistic based morality is retained in the transition, so that there is an illusion of morality, even when a society has nearly completed the transition.

Christian Worldview

One of the biggest errors we make is to compare the world to our own idealized world (in which there is no evil or suffering) and thereby rule out a Christian foundation. If we take the world as it really is, including both beauty and pain, then the Bible is the best explanation for the real world.

The Christian worldview (Biblical worldview) would fit as a subset of the more general Theistic worldview. Merely holding to a Christian worldview does not make one a Christian, but a consistent Christian should look at life from a Christian/Biblical worldview.

In addition to the concepts of the Theistic worldview the Christian worldview would add these specifics from the Bible:

- God's nature and purposes are revealed in the Bible.
- Our meaning, crisis, and rescue is detailed in the Bible.
- The Grand Story of history (from the Bible) explains our world and our place in it.

When we talk about God it is important that we clarify what we don't mean, so that there's no confusion about our worldview.

God is not---

-Merely a great Being who "lit the fuse," would up the machine, and then left it on its own ever since Creation (Deism)

-An Infinite Mind, who knows all things but does not interact with His Creation (God of the Philosophers)

- A Creator who placed the basic laws in place and then left everything to chance (God of the Scientists)

-A God who is used to explain everything we do not understand and everything the laws of science cannot explain ("God of the Gaps")

-A God that we are all part of (back to Pantheism)

-God that is somehow ourselves (New Age concept)

Instead, "God-is that ultimate reality whose Trinitarian nature, personal character, moral excellence, wonderful works, and sovereign rule constitute the objective reference point for all reality. From a Biblical perspective, the universe is not neutral but comes with an intrinsic meaning rooted in God." [15]

Essentials of the Biblical Christian worldview- [16], [17]

- View of God: An infinite, personal God exists. He created a finite, material world. Reality is both material and spiritual. The universe as we know it had a beginning and will have an end.
- View of man: Humankind is the unique creation of God. People were created "in the image of God," which means that we are personal, eternal, spiritual, and biological.
- View of truth: Truth about God is known through revelation. Truth about the material world is gained via revelation and the five senses in conjunction with rational thought.
- View of moral values: Moral values are the objective expression of an absolute moral being.

There is a vitality and a depth of meaning associated with the Christian worldview:

- We look at a world of physical reality, totally infused with meaning.
- We look at nature and see it as God's detailed handiwork.
- We look at the actions of physical objects and see God's physical laws at work.
- We look at broken people and see them as made in the image of God, with great potential.
- We look at powerful people and see God's allowing them to rule.
- We look at geopolitical situations and see opportunities for God's kingdom to be manifested.
- We look at other believers and see God's wonderful saints.
- We look at nonbelievers and see those for whom Christ died.

Van Til argues that the Christian worldview is the necessary precondition of any predication whatsoever. That is any person who utters a sentence either knowingly or unknowingly uses the Christian understandings of the world. This does not mean that the person is a Christian but simply that the only worldview that comports with the presuppositions necessary for any speaker's utterance is the Christian worldview. [18]

DISCOVERING & TESTING A WORLDVIEW

Discovering your Worldview

Manning and Curtis have prepared a "belief inventory" to help a student discover his or her worldview, including such questions as these: [19]

What is Real? (Metaphysics)

- How did human beings originate?
- Is human nature the same for all people?
- How do you explain the origin of the universe?

Does God exist?

- What is the relationship between God and the world?
- What is True? (Epistemology)
- Can we know anything for sure?
- What is the most dependable source of truth?
- How can we know if a belief is true?
- Can science explain everything?

What is Valuable? (Axiology)

- What is most valuable or worthwhile?
- Are ethics relative or absolute?
- Are people basically selfish or basically altruistic?
- What is the source of moral values?
- Is the individual or the society more important?

Evaluating a Worldview

Ken Samples suggests nine tests for a worldview- [20]

1. Coherence – Is it logically consistent?
2. Balance – Is it appropriately balanced between simplicity and complexity?
3. Power & Scope – How well does it explain and how wide is the range of explanation?
4. Correspondence – Does it correspond to empirical facts and human experience?
5. Verification – Can the central truth-claims be verified or falsified?
6. Pragmatic – Does it promote relevant, practical, and workable results?
7. Existential – Does it address the internal needs, desires, and aspirations of humanity?

8. Cumulative – Is it supported by multiple lines of converging evidence?
9. Competitive – Can it successfully compete in the marketplace of ideas?

Other (Limited) Worldviews [21]

1.Deism

Deism is a mix between Theism and Naturalism. It assumes that that a theistic God initiated the Universe in the distant past, set everything in motion, and then somehow stepped aside, leaving only physical laws but no Personal interaction (essentially leaving an effectively naturalistic world). Several of the nation's founders, including Thomas Jefferson, were Deists.

2.Animism

Animism is much like pantheism, with the additional belief in multiple spirits who control aspects of nature. Rivers, trees, and plants are often linked to specific gods or spirits.

3.Greek Polytheism

Classical Greece had stories of a huge number of larger-than-life gods (Zeus, Athena, Hermes, et.al.) who possessed great powers but indulged in petty squabbles.

Philosophical Background

How do massive changes in worldview or social mindset come about? Christian philosopher Francis Schaeffer [22] suggested that ideas that originate with philosophers, especially in the universities, eventually work their way into popular culture. He summarized a few of the individuals responsible for these upheavals:

Rene Descartes (1596-1650)

Descartes was a Roman Catholic mathematician who began his treatise from a position of doubt: If all knowledge comes through the senses how can I trust my senses? How can I know anything for sure, including my own existence? Descartes' famous conclusion was "Cogito ergo sum": "I think; therefore I am." Even though he acknowledged God, Descartes' faulty position was starting from himself to reason to everything else and separating man into body and mind.

David Hume (1711-1776)

Hume was an empiricist, who taught that only experience and observation can lead to truth. He was highly critical of the church and held that miracles were a violation of the laws of nature (hence, essentially impossible). He was famous for his skepticism, the idea that we can't know anything about the external world with certainty.

Immanuel Kant (1724-1804)

Kant held that knowledge was limited to experiences that actual objects were beyond the reach of our senses. Kant divided the world into a "phenomenal realm" (the world of nature, accessible to us) and a "noumenal realm" (the world of universals and ideals). In other words, people can think about faith and morality in a way that is different from, and not necessarily interacting with, how we think about physical reality. Unfortunately, many approach faith that way today.

Georg Hegel (1770-1830)

Hegel developed a model of history that included thesis, antithesis (the opposite), and synthesis (a merging of both. While Hegel didn't argue for the relativity of truth, if his theory is applied to propositional truth, then truth is ever-changing (which many, unfortunately, believe today).

Soren Kierkegaard (1813-1855)

Kierkegaard was a clergyman deeply concerned about the lack of vitality in the confessing church of his day. In his book Fear and Trembling he proposed the idea of taking a wild plunge into the Christian life, a "leap of faith." Kierkegaard is regarded as a father of existentialism, and, unfortunately, many today think of faith as a blind leap.

Friedrich Nietzche (1844-1900)

Nietzche is famous for developing the concept of the Superman or Overman and his exclamation that "God is dead, and we have killed him." The actual meaning of his writings is debated. He had no use for traditional religion and held that culture had eliminated even the notion of God. His apparent goal was for individuals to rise above mass culture and create their own values and lifestyle.

The Existentialists

In a world without external meaning, where individual life seems "absurd," alienated, and estranged, the existential philosophers wrote of the need to create meaning by performing some action to "authenticate" oneself.

Albert Camus (1913-1960)

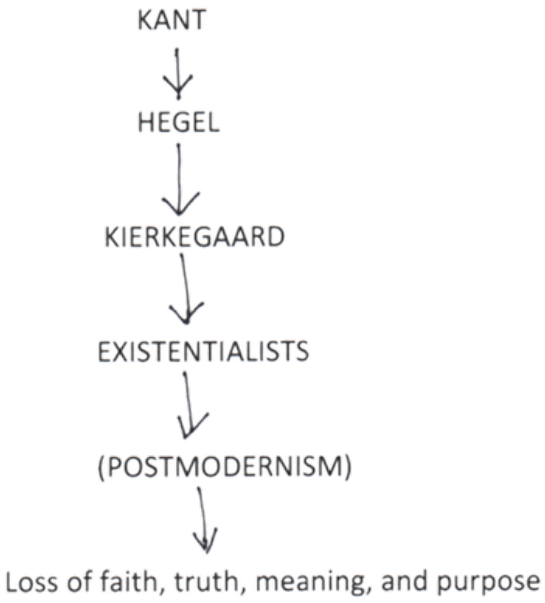
Camus was famous for applying the "myth of Sisyphus" to human life. Life is so meaningless that it is like pushing a boulder up a cliff only to have it roll back down upon you, over and over again. Yet, somehow, this determination gives rise to meaning.

Karl Jaspers (1883-1969)

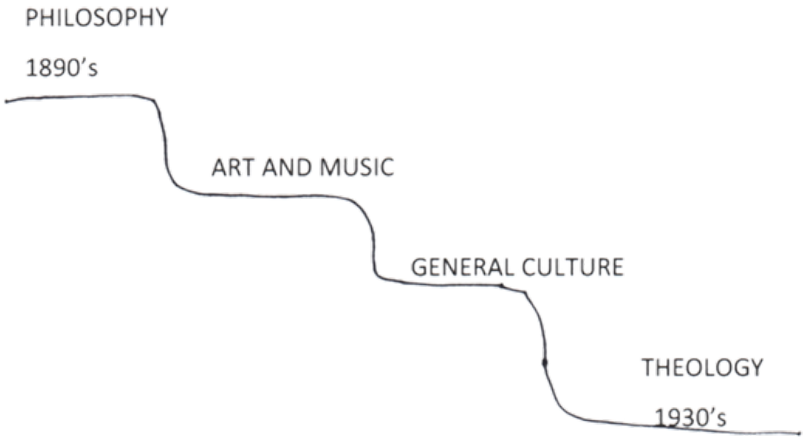
Rather than sink into despair at our inability to understand reality, Jaspers encouraged individuals to take a "leap of faith" towards "limitless freedom" and "authenticity."

John Paul Sartre (1905-1980)

Contrary to the Greek philosophers, John Paul Sartre wrote that "existence precedes essence." Sartre was concerned with issues of freedom, responsibility, justice, and Marxism.



The result of the primary philosophers of the past two hundred years was what Schaeffer termed the "line of despair," which descended further down with each new thought and headed towards absolute despair of knowing anything or finding any purpose. [23]



CONCLUSIONS

Worldviews are Everywhere

Every thinking person holds a worldview and his or her behavior is influenced, consciously or subconsciously, by that worldview. Understanding a person's worldview may be a valuable step in developing meaningful relationships and in sharing the Gospel.

Worldviews and Meaning-

Naturalism struggles with the idea of inherent meaning in the universe.

For Richard Dawkins the world was not created, has no purpose, and fits with no meaning to any part, including human lives:"The universe we observe had precisely the properties we should expect if there is, at bottom, no design, no purpose, no evil and no good, nothing but blind pitiless indifference." [24]

In this case, existentialists are correct: a naturalist has to invent his or her own meaning.

For the Christian theist, meaning is present in multiple ways-

- All that exists is traced back to God's purposeful creation. The universe exists-and we exist- to glorify God.
- Human life is meaningful as created in God's image.
- Our actions are meaningful in the light of a final judgment (Eccles. 12).
- All that exists is related to other parts of existence.

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CHAPTER 7: EVIDENCE

INTRODUCTION

Some people say," I'm glad you believe in Jesus (figuratively patting us on the head, like a little child). It's nice. It makes you happy. I don't think it's true, but faith is a beautiful thing."

That's rotten! If it's not true, it's a lie. Lies are ugly. Lies make us deceived or deceivers. If it's not true we shouldn't believe it, nor should anyone else.

Why should anyone believe the Christian message? Because there is a vast body of evidence that confirms it.

Can we prove that God exists? Can we prove that Jesus is the divine Son of God? It is essential to state that our intent is not to "prove" the existence of God or the truth of Scripture "beyond a shadow of a doubt." "Q.E.D." type proofs belong strictly to mathematics and logic. Instead, the goal is to offer evidence that points to and is consistent with the Christian message. History, legal cases, and theological truth depend on a conviction based on the weight of the evidence. (Apologist Josh McDowell titled his first book Evidence That Demands a Verdict.) No single piece of data can confirm the Christian message, but the pattern is powerful when examined as a whole.

INTRODUCTION

From the Greek word *apologia* (reasons) comes the word "apologetics." This word, apologetics, is related to giving reasons for our faith. "But worship the Lord God in your hearts: and be ready always to give an answer to every man who asks you for a reason for the hope that is in you with gentleness and respect." (1 Pet. 3:15)

There are a few cautions to keep in mind as we deal with apologetics:

1. No one can be argued/reasoned into God's kingdom. Apologetics can show that it's reasonable to believe in Christ. God's spirit must work, and the human will must respond.
2. We don't "prove" God.
3. Apologetics may simply move smokescreens aside so that a person can clearly consider the Gospel.
4. We cannot use apologetics knowledge as a point of pride.
5. Attitude is important. We can trounce someone in a debate but lose their trust and friendship – and even drive them further away from Christ.

We must approach everything with prayer and humility. (1 Pet. 3:15 first part)

We must be careful not to overstate the case. No single piece of data makes the whole case. If we clearly discover design in the universe, that doesn't prove that the God of the Bible designed it. It only shows that it was designed. It's the whole picture that points to God.

Opponents of the Scripture often argue this point: Just because the Bible mentions real people and places doesn't prove that it's true. Lots of historical fiction is built around real events. Even Superman has met presidents and visited world landmarks.

It is only when we connect the data dots- evidence from history and archaeology, prophecy, design, science, philosophy, and the miraculous- that we see a complete picture and a powerful weight of evidence.

Two similar concepts are used-

1. Legal/detective/forensic- Look at the evidence. See where the trail of the evidence leads.
2. Scientific/engineering - Examine the data. Connect the data points. See what theory fits the data.

Various apologetics ministries and books have taken this evidence-based approach:

- *Evidence That Demands a Verdict* - the classic by Josh McDowell
- *The Case for Christ* - Lee Strobel
- *Reasons to Believe* - Hugh Ross
- *Cold-Case Christianity* - J. Werner Wallace

THEOLOGY GRAPHS (BY BILL)

Making sense of the data

Most people who think about life want to make sense of their world: What's going on? Where do I fit in? How do I safely navigate the system? How do I make sense of the data of the universe?

As thinking people go through life, they continually make an effort to make sense out of all that they see and experience, fitting the data into categories in their mind, shaping a picture of what the world is like, or, in effect, plotting it on a "theology graph."

Everyone has a "theology curve," whether they know it or not. When new data is encountered that doesn't cleanly fit the graph, we have one of three choices- (1) interpolate, (2) extrapolate, or (3) ignore the data.

Unfortunately, many people fall into one of these traps when they deal with the data:

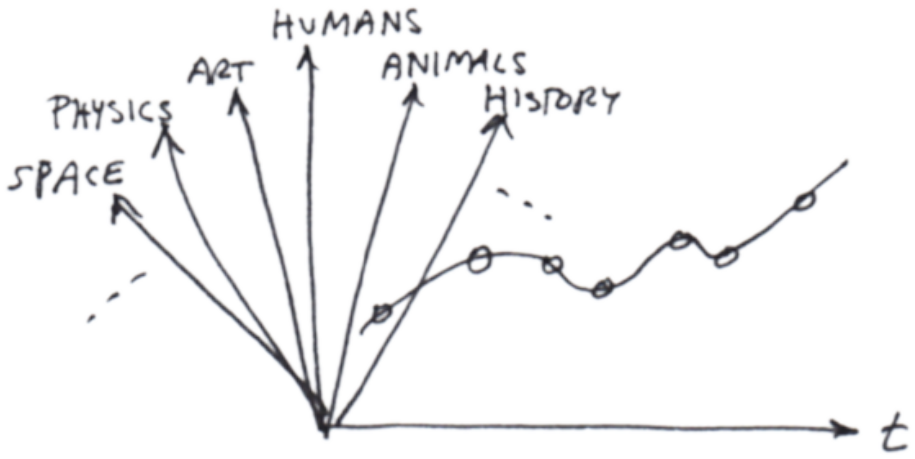
1. They assume a particular curve before they even look at the data. ("I was born a Muggludian - or whatever - so that is what I believe. Don't confuse me with facts.")

2. They fit too few points to the data and then extrapolate way beyond the data. ("I found out that Friggilism is the right religion because it explains why there are wars. Therefore, it must explain everything.")

3. They ignore or omit data. ("That couldn't have happened. It doesn't fit with what I believe.")

In the end, if we honestly and accurately approach the real data, it will line up with the Christian message.

What if we were to try to plot every piece of data in the world over all time into an n-dimensional graph? To make it simple, consider just the data available to you, including history and others' statements.



The data might include- cats exist, babies are born, ants seem industrious, bears eat fish, people die, football teams have a quarterback, the sun comes up each morning, earthquakes occur. Beethoven wrote symphonies; various religions exist, people work, we elect leaders. Science predicts physical actions, and stars exist. People own businesses; wars occur, the Bible exists, computers crunch numbers, some people commit crimes, and sunsets are beautiful. Some people worship idols; plants need water, people marry and establish families. Turkey is a country; people are creative and artistic.

What theory best fits all the various data points? I would suggest that Biblical Christianity best fits the data of the world. The Bible actually addresses hundreds of earth-oriented topics.

Don't discard or disregard data

Ralph Muncaster notes:

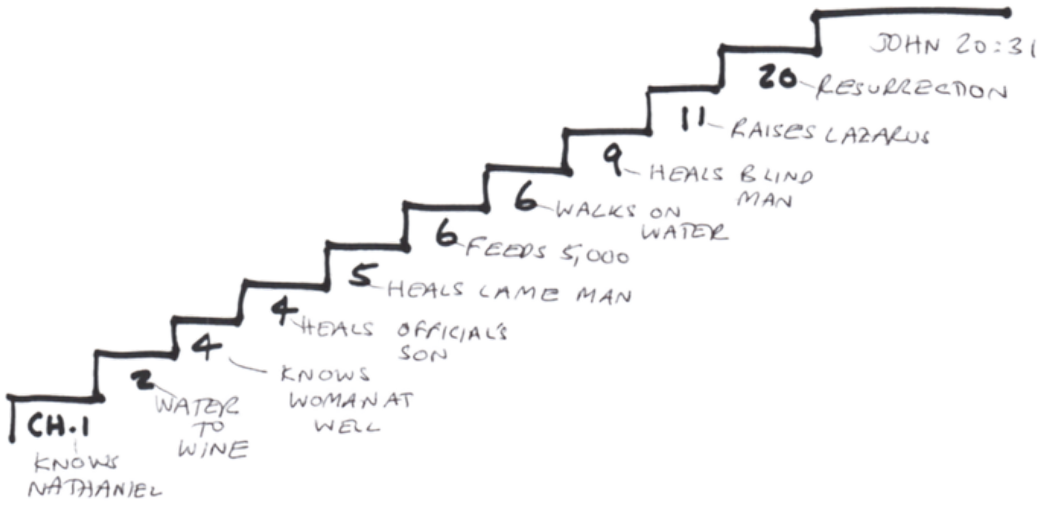
(The author) became troubled over the fact that intelligent scientists were not facing reality. What opened his eyes to the cause was George Wald's statement in the May 1954 Scientific American...In which he concluded that even though "spontaneous generation was disproved one hundred years ago," the only other possibility, "that of supernatural creation," was entirely unacceptable and therefore by choice the "impossible," that life arose spontaneously by chance, would be believed. In other words, Mr. Wald was admitting that he'd rather adopt the impossible than belief in a supernatural Creator. [1]

Evidence and the book of John (by Bill)

The Gospel of John is a book full of evidence. John stated that "These things are written that you might believe that Jesus is the Christ and might have life through His name." (John 20:31)

The pattern is that Jesus taught or did a miracle "and some (or many) believed." (John 2:11, 2:23, 4:39, 4:53, 8:30, 10:42, 11:45)

The miracles actually build in intensity to the crescendo of the resurrection:



CATEGORIES OF EVIDENCE

As engineers, we make decisions based on data. So what's the external data for the Christian message?

The evidence can be classified into four basic categories:

1. Historical
    a. People, places, real events
    b. Archaeology
2. Philosophical
    a. Metaphysics
    b. Ethics
    c. Epistemology
3. Scientific
    a. Life itself and human life
    b. Evidence supporting design
4. Miraculous
    a. Answered prayers and conversions
    b. Fulfilled prophecy

Question -Shouldn't I examine every possible philosophy and religious system?

To that question, I would answer:

1. There aren't enough years in anyone's life to do that.
2. Once you've found the treasure, you don't keep digging.

Circular reasoning?

An alternative approach to the evidence is the argument that Christians often make their case based on circular reasoning:The Bible points to Christ, and Christ affirms the Bible's trustworthiness. That is, in fact, circular. A non-circular approach to the same data, however, would be the following:

The logical approach:

- God exists and could have communicated with humanity.
- The Bible is trustworthy (Manuscripts, history, archaeology)
- The Bible is divinely inspired (Fulfilled prophecies)
- The Bible presents Jesus Christ.
- Jesus claimed to be God (John 10:30-33, John 14:19), and proved it by His resurrection (Rom, 1:4, Rom. 4:24-25)
- Jesus rose from the dead.
- We need to respond to Jesus.

1. Is there evidence for the existence of God?
    a. Sun, moon, stars, the vastness of the universe
    b. Evidence for design
2. What evidence indicates that the Bible is (1) trustworthy and (2) inspired by God?Hank Hanegraaff suggests we consider the acronym "MAPS": [2]
    a. Manuscripts
    b. Archaeology
    c. Prophecy
    d. Scriptural consistency -over 70 authors, over 2,000 years of input
3. What claims are made by and about Jesus Christ?
    a. Life of Jesus
    b. Claims of Jesus
    c. Jesus died (for sins) and rose again.
4. What evidence supports those claims?
    a. Empty tomb
    b. Transformed disciples
    c. The spread of the Christian message
    d. Transformed lives today

Let's examine each category of evidence in turn.

HISTORICAL DATA (BY BILL)

History is very important because God wrote history, has written history and is writing history since He's outside of time. We are in time, so we have to refer to history. If you understand history, then it teaches us about God. The Bible is a history book, telling us about kings and wars, creation, and the nature of God. There's been a movement in the last 20-30 years to change and/or eradicate history. It's gone beyond the philosophical area and is now widespread "deconstructionism". (Deconstruction holds that language can't represent meaning and that literature has no single interpretation.) Deconstruction is already considered passé in some universities, but deconstructionism's remnants have gone into the political scene. In the extreme, what you conclude is that you can't know anything for sure. There's no sense reading history. History is meaningless. The result fits with a Marxist mindset that says that you can't know anything except for what we tell you. Real history, though, talks about God.

One of the most verifiable acts in history was that he died and rose from the dead. That's very verifiable in history. 1 Corinthians 15 tells us four areas of the Gospel that are important: (1) Jesus Christ died on the cross according to the Scriptures, (2) He was buried and rose again on the third day according to the Scriptures, (3) He was seen of Cephas and then of the twelve, and (4) after that he was seen by five hundred brethren at once. That last area of the Gospel tells you that His resurrection was verifiable. It wasn't a resurrection that occurred but was witnessed by only one person, and maybe he was a nut. It wasn't one that just occurred to a huge bunch of people amid a mass hysteria. After the resurrection, Jesus talked with people. He conversed with people. He touched people who had been with Him for three years. They knew who He was. They verified that He was alive again and that He had died. If you're wondering whether philosophy has anything to do with this, consider another religion. Islam, for instance, simply says it never happened. You have to go to great lengths to refute the resurrection. It's stuck in history. If you think about it, the Old Testament has woven together these categories. The miraculous is interwoven with history, and it's interwoven with philosophy. They all hang together. You don't base your faith on just one of these areas.

PEOPLE, PLACES, AND EVENTS (BY PAUL)

The Biblical message is thoroughly anchored in history. Descendants of Jacob came into Israel's land (formerly Canaan), established cities, anointed kings, fought wars with neighboring lands, and, after lengthy disobedience, were subjected to (with many exiled to) the Assyrian and Babylonian empires. The Romans conquered Israel before the time of Christ and established their rule throughout the Middle East. Available for our study are remains of many of the original cities with artifacts, historical records of kings and wars, and external documents that line up with Biblical accounts.

Some of the ruling individuals who interacted with the Jewish people: [3]

Egypt:

- Pharaoh Shishak (ruled 945-924 BC)
- Pharaoh Neco (610-595 BC)

(Aram) Syria:

- Hadadezer (c. 844 BC)
- Ben-Hadad (844-842 BC)

Assyria:

- Tiglath-Pileser (745-727 BC)
- Shalmanaser (726-722 BC)
- Sennacherib (705-681 BC)

Babylon:

- Nebuchadnezzar (605-562 BC)
- Evil-Merodach (562-560 BC)
- Belshazzar (543-540 BC)

Persia:

- Cyrus (576-530 BC)
- Darius (520-486 BC)
- Ahasheurus (Xerxes) (486-465 BC)

Israel and Judah:

- Omri (884-873 BC)
- Ahab (873-852 BC)
- Pekah (750-732 BC)
- Hezekiah (726-697 BC)
- Manasseh (697-642 BC)

Israel under Roman rule:

- Herod Antipas (1-39 A.D.)
- Pontius Pilate (26-36 A.D.)

Places mentioned include Egypt, Canaan, Moab, Ammon, Syria, Assyria, Babylon, Philistia, Rome, and Athens.

Someone might argue that many popular novels are historical fiction, where fictional characters interact with real historical figures. That's not the format of the Bible. No one was writing historical fiction in Bible times. The manuscripts are old and Near-Eastern. They follow the account of one family and people over a few thousand years and are in agreement with historical findings. We find David's kingship established in about 1000 BC, a divided kingdom two generations later, a major invasion and exile in 586 BC, and a restored temple in 516 BC. Babylon fell to Persia in 539 BC. Alexander, the Great of Greece, invaded Israel in 332 BC. The Romans conquered Jerusalem in 63 B.C. and destroyed the city in 70 A.D.

ARCHAEOLOGY (BY PAUL)

The renowned archaeologist Nelson Glueck said this: “It may be stated categorically that no archaeological discovery has ever controverted a Biblical reference. Scores of archaeological findings have been made which confirm in clear outline or exact detail historical statements in the Bible. And, by the same token, proper evaluation of Biblical descriptions has often led to amazing discoveries.”

In addition to verifying the existence and location of cities, Near Eastern archaeology will often focus on clues to ancient people's daily lives, examining their money, their pottery and eating utensils, their personal belongings, and the religious artifacts in a local region. (Israel's pagan neighbors did worship Baal, Molech, Asherah, and Dagon.)

One of Near Eastern archaeology's successful outcomes has been a series of discoveries that silenced Biblical skeptics.

For many years opponents of scripture argued that Hittites were fictional until Winckler (1906) uncovered traces of the Hittite civilization, including an entire library of work.

The claim was made that there never was Davidic dynasty until the Tel Dan stele was found in 1993.

Some doubted that Balshazzar ever reigned in Babylon, until documents explain his reign as co-regent were found in 1929.

Some significant findings in archaeology: [4]

- Ebla/Tell Mardikh tablets-discovered 1975 in Syria- dated to 2250 BC- earliest mention of Ugarit, Canaanites, and Lebanon
- Boghazkoy tablets-discovered 1906 - verified the Hittite civilization
- Moabite stone (Mesha Stele) -discovered 1868 -dated about 840 BC- mentions Moab’s war with King Omri of Israel (2 Kings 3)
- Ras Shamra tablets -discovered 1928 in Syria-dated about 1300 BC -described Canaanite religions, Baal worship and child sacrifice
- Tel Dan stele -discovered 1993 - dated to the 8th century B.C. -mentions Syria's war with "the house of David"
- Nuzi tablets -discovered 1930 in Iraq-describes life in the region before 1000 BC, mentions the Horites (Genesis 14)
- Lachish relief -discovered 1847 at the palace of Sennacherib -describes the siege of Lachish (2 Kings 18)
- Merneptah stele- discovered 1896 in Egypt -mentions Pharaoh’s victories over Libya, Gezer, and Israel
- Kurkh stele -discovered 1861 in Turkey -describes Shalmaneser’s war with Syria and Israel
- Black obelisk -discovered 1846 in Iraq -describes Assyria’s leader receiving tribute from “the son of Omri” (2 Kings 9)
- Gallio inscription- discovered c 1905 in Greece- dated to 52 A.D. -verified the Roman proconsul Gallio who dismissed charges against the Apostle Paul in Corinth (Acts 18)

- Erastus stone - a memorial paving stone discovered 1929 in Corinth, Greece-laid by Erastus the city treasurer, mentioned by name and title in Romans 16:23
- In addition, portions of entire ancient cities have been excavated or restored:

Excavation site	Biblical references
Schechem (Nablus) - public buildings, residences, nearby well	Gen. 12, Joshua 24, Judges 9
Hazor - evidence of burning, Baal figurines, water system, six chambered gate	Joshua 11, Judges 4, 1 Kings 9
Jericho - 20 successive settlements found, evidence of destruction by fire, nearby springs, ancient walls and towers	Num. 34, Joshua 6, Luke 19
Hebron - Cave of the Patriarchs, mikvey (ritual bathing pool), ancient staircase	Gen. 23, Joshua 14, 2 Sam. 5
Dan (Laish) - ancient gate, evidence of destruction, high places for pagan worship	Joshua 19, Judges 18, 1 Kings 12
Megiddo - Canaanite palaces, four room houses, fortification gates	Judges 1, 1 Kings 9
Lachish - palaces, fortifications, water shaft, military writings	2 Kings 18, Jer. 34
Tell Shevai (Beersheba) - city wall and gate, deep well, storehouse	Gen. 26, Joshua 20
Beth Shan (Beit She-an) - Canaanite temple, ancient synagogue	Joshua 17, 1 Sam. 31
Shiloh - massive wall, public building, heap of pottery	Joshua 18, 1 Sam. 2

Excavation site	Biblical references
Gezer - Canaanite temple, fortifications, water shaft	Joshua 10, 1 Kings 9, 1 Kings 14
Gibeah (Tell el Ful) - corner tower, portions of a fortress	Joshua 18, 1 Sam. 10
Ashkelon - Canaanite silver calf, Philistine burial site	Joshua 13, Judges 14, 1 Sam. 6
Ekron (Tel Miqne) - fortified city, iron weaponry	1 Sam. 5, 1 Sam. 17
Caesarea - Herod's harbor, Herod's theater, Roman acqueduct	Acts 23
Capernaum - ancient synagogue, ancient building (traditionally identified as the house of Peter)	Mt. 4, Mt. 9
Bethlehem - Canaanite burial ground, Rachel's tomb	Gen. 35, Micah 5, Luke 2
Nazareth - evidence of Jewish settlements, including crafts and quarrying	Mt. 2, Luke 4
Chorazin - ancient synagogue, including "Moses' seat", remains of olive press	Mt. 11
Genneserat (Chinnereth) - 2,000 year old fishing boat at Kibbutz Ginosar	Joshua 19
Herodium - palace fortress, Herod's tomb	Mt. 2
Jerusalem - Temple mount, Hezekiah's temple, Pool of Siloam, Pool of Bethesda	1 & 2 Kings, Gospels, Acts

Excavation site	Biblical references
Ephesus - homes, business street, theater, remains of Temple of Artemis	Acts 19, Rev. 2
Smyrna (Izmik) - ancient market, underground sanitation system	Rev. 2
Thessalonica - ancient bathhouse, mint	Acts 17
Pergamum - Acropolis, Temple of Zeus, Temple of Athena	Rev. 2
Sardis - Temple of Artemis, Roman bath - gymnasium complex	Rev. 3
Philippi - wall fortification, forum, theater, Via Ignatia Roman Road	Acts 16
Corinth - isthmus, waterway, Temple of Apollo, Bema (judgment seat)	Acts 19
Athens - Acropolis, Parthenon, Mars' Hill	Acts 17

In every portion of Old Testament history, we find good evidence that the Scriptures speak the truth. In many instances, the Scriptures even reflect firsthand knowledge of the times and cultures it describes. While many have doubted the accuracy of the Bible, time and continued research have consistently demonstrated that the word of God is better informed than its critics. [5]

MANUSCRIPTS

Unlike nearly every example of classical literature, textual material of the New Testament can be traced back to within 60 years of its writing (Fragments date to about 125 A.D.) Approximately (5, 500) manuscripts of the N.T. exist, many of which have been studied in detail. In a fascinating lecture entitled "Is what we have now what they wrote then?" Greek scholar Daniel Wallace examines the breadth of these manuscripts and the differences between them, concluding that the actual differences amount to less than (2%) and don't affect any doctrine. [6][7]

The Dead Sea Scrolls

In 1947 a young Bedouin shepherd in the rocky wilderness near the Dead Sea (Qumran) was tossing rocks into a cave (apparently looking for a goat that had wandered off) when he made one of the greatest discoveries of the Twentieth Century. One of the rocks shattered a pottery jar found to contain an ancient manuscript. In fact, several of the caves around Qumran were found to be filled with manuscripts deliberately preserved by an ancient community that existed around the time of Christ (Essenes). Some contained theological rituals, but many of the papyri were copies of Old Testament texts, including portions of every Old Testament book except Esther. Among the most significant findings was a scroll of the prophet Isaiah dated a full thousand years earlier than the previous oldest manuscripts and with no significant differences in the wording. This showed that the Jewish scribes were careful and faithful in their transcribing of the manuscripts. The Old Testament text is reliable.

Extra-Biblical Documentation

While the life of Jesus is described in detail in the Gospels, some secular historians also mentioned Him:

Flavius Josephus writes in *Antiquities of the Jews* [8] "Now around this time lived Jesus, a wise man. For he was a worker of amazing deeds and was a teacher of people who gladly accept the truth. He won over many Jews and many Greeks. When he heard him accused by the leading men among us, Pilate condemned him to the cross, (but) those who had first loved him did not cease (doing so). To this day, the tribe of Christians named after him has not disappeared."

In The Annals, Tacitus describes how the Roman emperor Nero falsely blamed "the persons commonly called Christians, who were hated for their enormities. Christus, the founder of the name, was put to death by Pontius Pilate, procurator of Judea in Tiberius's reign."

PHILOSOPHICAL EVIDENCE

The philosophical ramifications of the Christian worldview are significant. According to theologian Francis Schaeffer, the reality of God (“the infinite-personal God”) and His Creation provide keys to addressing three of the classical areas of philosophy: metaphysics (the philosophy of existence), ethics (the philosophy of right behavior), and epistemology (the philosophy of knowledge).

1. Metaphysics- why is there anything at all? Why is there something rather than nothing at all?

If you begin with the infinite, personal God, Christianity is certainly reasonable. Where did everything come from initially? Can something arise from nothing? There are only three alternatives: [9]

- Everything arose from absolutely nothing ("Nothing-Nothing"), or
- Some big molecule was already there (Where did it come from?), or
- Everything arose from a personal Creator.

When we look at humanity we need to think about "the mannishness of man." There really is something unique about humans. No animal has the creativity, personality, hunger for significance, or capacity for art that humans have. Humanists (naturalists) suggest that there is little fundamental difference between humans, animals, and the rest of the world. Pantheists suggest that everything is part of one whole without distinctions. But, there are real differences between living and non-living things and between humans and other living things. We have physical bodies in common with animals, and we have conscious personality and moral sense in common with God.

2. Ethics- how do we know what's good/right?

Moral standards are possible because they derive from the moral and holy nature of God Himself.

Schaeffer suggest that there are four primary sources for a society's moral standards: [10]

1. The individual by himself/herself
   a. A majority in the society (51%)
   b. An elite authority (or dictator) who makes the rules
   c. An external authority (God, scripture)

Only a divinely given moral law can be applicable to all cultures and times.

3. Epistemology- How can we know the world? Is the source of knowledge immanent or transcendent?

Christian answer- All knowledge originates from God, who created us with the capacity to understand (in part) our world.

Schaeffer develops this approach in detail:

The alternative, the naturalist position, assumes "the uniformity of natural causes in a closed system", a position which would rule out revelation from God.

Christian epistemology stands in stark contrast to the non-Christian worldview. The presupposition of Christianity begins with the God who is there. God is the infinite-personal Being who has made man in His image. God made man a verbalizer in the area of propositions in his horizontal communications with other men. Thus God communicates to us on the basis of verbalizations and propositions by means of the written Word of God. [11]

All people live as if reality is unchanging from moment to moment and as if their experience and understanding of the world correlate to reality.

Man's attempted autonomy has robbed him of reality. He has nothing to be sure of when his imagination soars beyond the stars, if there is nothing to guarantee a distinction between reality and fantasy. But on the basis of the Christian epistemology, this confusion is ended, the alienation is healed. This is the heart of the problem of knowing, and it is not solved until our knowledge fits under the apex of the infinite-personal, Triune God who is there and who is not silent." [12]

"Starting with himself, a person cannot establish an adequate explanation for the amazing possibility that he can observe the world around him and be assured that his observations have a correspondence with reality" [13]

In addition, philosophers have considered four classical arguments for the existence of God: [14]

1. Cosmological – Based on the principle of cause and effect, the cosmos itself must have a First Cause.
2. Teleological – Because purpose implies (deliberate) design, all design must ultimately have a Designer.
3. Moral – Human morality indicates that there must be a universal moral law and a universal Moral Law-Giver.
4. Ontological – The concept of "being" implies that God is a perfect and necessary Being.

None of these are sufficient in themselves to validate the existence of God, but taken together they make a strong case.

In the book *How Reason Can Lead to God* [15] philosopher Joshua Rasmussen builds a logical set of "bridges" to God's existence based on externality, actuality, and the existence of mind, matter, morals, and reason.

The Explanatory Power of the Gospel

One strong element of evidence for the Christian message is its ability to explain so many of the significant questions people ask-

- Why is there something rather than nothing at all?
- Why is there order in the universe rather than pure disorder?
- Why does the universe seem fine-tuned for life?
- Why do humans seem different from animals?
- Why is life significant?
- Why is the world messed up?
- Where do morals come from?
- Where do wars and conflicts arise form?
- Why is forgiveness important?
- How can there be both mercy and justice?
- How can there be life after death?

J.I. Packer describes this quality (explanatory power):

(Consider) the test of explanatory power. As the higher can explain the lower, and the more complex the simple, but not vice versa, so one test for any position claiming, as all forms of Christianity do, to embody final truth about life is its power to account for actual human behavior and states of mind, including denial or disregard of its own claims, and preference for other options. Also, it must give good answers to man's inescapable questions about life's meaning, purpose and value, including the question of what death means, both others' death and our own, and whether the certainty of death does not render life senseless—the question with which Woody Allen, surely the shrewdest and most serious comedian of our time, as well as the funniest, is confessedly preoccupied. I would maintain that consistent Christianity, with its radical doctrines of this life as a preparation for the next, and of sin as touching the mind no less than the heart, and of the working of God's wrath and grace side by side in our fallen world, does not lack credibility here either. [16]

Themes

The Bible is encyclopedic in its range of topics, including dozens of plants and animals, and dealing with stress, fear, anger, and grief. All of the great themes of life are touched on in the Bible and are given God's own values: Reality, Wisdom, Truth, Love, Justice, Law and Government, Mercy, War, Peace, Sacrifice, Forgiveness, Life, Death, Health, Spiritual Reality, Meaning, Purpose, Family, Work, Money, Sexuality, Nature, Power, Deception, … These same themes are the stuff of philosophy and occur throughout literature and history.

SCIENTIFIC EVIDENCE

The heavens declare the glory of God, and the skies above show forth His handiwork." (Psalm 19:1)

"For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that people are without excuse." (Rom. 1:20, N.I.V.)

Most of the observable data of science suggests design rather than randomness, and design suggests a Designer:

Science can't "observe" God. But we can observe a universe that yields evidence of one of two things: It's either God's handiwork, or it got here by accident, without a creator. The evidence has to point one way or the other. And scientific discoveries of this century clearly show that our universe is no accident, that there is an intelligent designer behind it all….What many non-Christians believe today is based on 19th-century science, which said our universe is self-sustaining and eternal—implying that it was not created. But modern science tells us the opposite—that our universe cannot sustain itself, that it's dependent on something outside of itself, and that our universe had a beginning, as the Bible says. [17]

Our study of the world -its intricacy and complexity - should leave us amazed:

- The vastness of the universe and the billions of stars
- The atom and subatomic particles
- The complexity of the living cell
- The coding aspect of the D.N.A. molecule
- The human brain, sense organs, and nervous system
- The possibility of modeling the physical world with mathematical equations
- The repeatability of natural laws
- The "fine-tuning" of physical constants

Walter Bradley, who has devoted years to the study of the intersection of science and faith, has described the amazing discoveries of the past century concerning some 50 requirements for life on earth, including: [18]:

1. Sufficient variety of elements
2. Abundance of key biochemicals (D.N.A., R.N.A., proteins)
3. A major element capable of forming stable bonds (carbon)
4. A chemical to act as a universal solvent (water)
5. Long-term sources of energy
6. Fine-tuning of 19 universal constants (speed of light, mass of the electron, electron charge, ...)

(Much of this will be developed in detail in upcoming chapters on Mathematics, Science, and Design).

While mathematical patterns, even complex patterns, exist throughout nature, what really captures our attention is the coding of information. True coding always involves intelligence, a mind that developed the code. The D.N.A. in every living cell is a code.

Our current realizations-

- It is (somehow) possible to study and begin to understand the world around us
- The universe itself had a beginning
- Earth seems finely-tuned for life
- We can't produce living, growing, reproducing organisms

MIRACULOUS EVIDENCE (BY PAUL)

God is a supernatural Being whose interaction into our natural world (His creation) will be nothing short of miraculous. Miraculous evidence encompasses those happenings that are linked to supernatural power. They are clearly out of the ordinary events and "more than coincidence". Miraculous evidence includes

- Conversions/ transformed lives
- Answered prayers
- Healings

- Other supernatural events

The “weight” of miraculous evidence is directly proportional to the nearness of the event to the individual. Something that happens directly to you carries more weight than something reported to you by a relative and far more weight than something you have simply read about. The “weight” that a person gives to miraculous data is related to the “distance” of the event.

- Level one- happened to you. This is always the strongest data.
- Level two- happened to someone you know. If they are believable, you have to consider the data.
- Level three- happened to someone you don’t know. This is the weakest data, but it can add up.

A caution is in order here - feelings are not miraculous events. They could simply be the follow-up from the pizza you ate earlier. Biblically we see that not all supernatural events originate from God. If the miraculous data is consistent with the scripture it is worth considering.

Conversions

Unless they came to Christ at a very young age every believer has a story of how Christ changed their lives or life direction. This “testimony” is a powerful piece of data, especially for those who knew them before and after salvation.
There are also records of dramatic conversions of individuals whose lives were changed from futility or destruction to blessing, including these:

- Saul of Tarsus was a Pharisee and hate-filled persecutor of Christians.
- John Newton (“Amazing Grace”) was a slave-ship captain.
- Nicky Cruz was a gang leader.
- Chuck Colson was a ruthless lawyer.
- Mitsuo Fuchida was lead pilot in the Pearl Harbor attack.
- Maria Anne Hirschmann (“Hansi”) was a Nazi youth leader.
- C.S. Lewis was an agnostic professor.
- Mincaye was an Ecuadorian head-hunter.
- Walid Shoebat was part of the P.L.O.

MIRACLES (BY BILL)

You learn about God in three ways: from His Word, the Bible; from the Holy Spirit; and from circumstances (experiences). That's why Bible study, prayer, and journaling (keeping a diary) seem to go together. Years ago, when I was just realizing that God works, not just in the Bible times, but here and now, I started to keep a list of miracles - that is, whenever I heard about a real answer to prayer, or any miracle, either first hand or something I'd read about, I recorded it. At first, they came slowly, one a month or so. But then the frequency increased, and when my "list of miracles" hit 800, it became a diary, because miracles were happening to U.S.! Two things happened, though. Not only did we change our definition of "miracle", but we found that God spoke through circumstances in a way we'd never realized before.

I know people who have had short legs lengthened instantly. I have a friend who was raised from the dead when she was a little girl. I know about five people who heard God speak audibly. I know people who had things happen to them that used to happen in the Bible: resurrections from the dead, walking on water, multiplying food. All those things still happen.

Now, if I opened things up and asked one of my classes, I'll bet you over half the class would have a story of some supernatural intervention where they've seen an actual answer to prayer or something off the wall supernatural. When you're talking to people with the three different worldviews, the idea of miracles sometimes doesn't seem to hold water.

If you're talking to a pantheist, it's not a big deal, because they believe that everything is supernatural, anyway. It could have just been anyone's mind.

But if you're talking to a humanist, it will blow him away. In fact, he'll have to say, "This does not fit. I don't believe you. You must be lying to me." So it's very important for Christians to tell the truth, because if you have a record of truth then when you tell your testimony, the people who listen to you will have to conclude that you are either crazy, or you're lying, or you're telling the truth. If you're telling the truth, then there's more to God then they thought. God still works, and that's neat. He can work through us.

Sure, we have plenty of the "old-fashioned" definition of miracles, such as when we've talked to someone who was raised from the dead, someone whose leg grew out significantly instantly after prayer, and seen and talked with people healed of incurable diseases. But the really big ones are the "little" ones (in men's eyes). It takes a much bigger God to orchestrate all of life, working through circumstances in which even evil men do things that further God's kingdom (Chairman Mao of Communist China ordered short wave radios for all the people in China, so he could communicate to them all. However, that gave them the equipment to listen to God's message by Christian radio, and the church grew by a factor of about 50 during the rule of the communists, after they had killed or driven out all the missionaries. We see that when we finally decide that we can't control a situation, and let God do it, He is freed to work through circumstances and do what we couldn't. It seems that most often He works through hard situations, like sickness, car wrecks, and other tragedies, because the real "you" comes out at those times.

Biblical Miracles

Those who don't acknowledge a supernatural Creator will often come up with an alternative explanation for the Biblical miracles:

- Jesus fed 5,000.

Non-supernatural explanation: The boy with the lunch so inspired the crowd on the hillside with his generosity that everyone who had brought a sandwich along took it out and shared it with his neighbor.

- Jesus walked on water.

Non-supernatural explanation: Jesus knew where the steppingstones were. (Somehow that doesn't inspire a sermon.)

MIRACULOUS EVIDENCE: PROPHECY (BY BILL)

When you read the Biblical prophets (like Isaiah, Jeremiah, Ezekiel, Daniel, Amos, Obadiah, Micah) the history there was predicted in advance. Daniel wrote about coming history before it ever happened. Liberal theologians had such a hard problem with that idea that they just decided that the book of Daniel must not have been written by Daniel but written by someone who lived after Daniel and after all the history occurred. They made it seem like it happened beforehand, because liberal theologians don't believe in God. If there isn't any God then you can't have any prediction of future events. So, therefore, those things in Daniel must have been written after the fact. Daniel predicted the invasion of Alexander the Great and the rise and fall of kingdoms. The miraculous, the fact that you can predict something in the future, is interwoven with history.

Fulfilled Prophecy (by Paul)

Many passages in the Bible are prophetic in nature, predicting events that would occur dozens or hundreds of years after the words were spoken. Several are very specific in their fulfillment, addressing cities and nations, details in the life of Jesus, and the Roman invasion of Jerusalem (70 A.D.).

Some prophecies are yet to be fulfilled (the return of Christ) and a few are obscure, but many were clearly pronounced long before the event and fulfilled in a very graphic manner.

- Prophecies concerning Israel-
- Exodus 34- Israel would occupy the land of Canaan
- 2 Kings--- The nation would be divided into two kingdoms
- Jer. 25:11-12 - Seventy years of captivity would follow after Jerusalem would fall to the Babylonians
- Isa. 44-45- A ruler named Cyrus would end the captivity and restore Israel
- Prophecies concerning Jesus and His followers-
- Micah 5:1-2- the Messiah would be born in Bethlehem
- Isa. 7:14 -the Messiah would be born of a virgin
- Isa. 9:1-2 -ministry in Galilee
- Isa.61:1-3 -ministry of compassion
- Isa. 35:4-6 -ministry of healing
- Zech. 9:9 -triumphal entry into Jerusalem ("Palm Sunday")
- Ps. 22, Isa. 53- the Messiah would suffer and die for mankind's sins
- Ps. 22:16 - His hands and feet would be pierced
- Ps. 22:18- clothes divided by soldiers
- Isa.53:12, 9 -killed with evildoers, buried in a rich man's tomb
- Ps. 16:10, Ps. 22:22-31, Isa, 53:10-11 - hints of His resurrection

- Acts 1:8, 2 -Disciples would receive power from the Holy Spirit
- Mt. 24:14- Jerusalem would fall and the temple would be destroyed

Tyre

One of the most detailed and graphic prophecies was one that concerned the ancient coastal city-state of Tyre, a major commercial center and port. Ezekiel 26:1-14 describes in detail the destruction of Tyre:

"In the 11th year, on the first day of the month, the word of the Lord came to me: "Son of man, because Tyre has said of Jerusalem, 'Aha! The gate to the nations is broken, and its doors have swung open to me; now that she lies in ruins I will prosper,' therefore this is what the Sovereign Lord says: I am against you, O Tyre, and I will bring many nations against you, like the seas casting up its waves. They will destroy the walls of Tyre and pull down her towers; I will scrape away her rubble and make her a bare rock. Out in the sea she will become a place to spread fishnets, for I have spoken, declares the Sovereign Lord. She will become plunder for the nations, and her settlements on the mainland will be ravaged by the sword. Then they will know that I am the Lord.

"For this is what the Sovereign Lord says: From the north I am going to bring against Tyre Nebuchadnezzar king of Babylon, king of kings, with horses and chariots, with horsemen and a great army. He will ravage your settlements on the mainland with the sword; he will set up siege works against you, build a ramp up to your walls and raise his shields against you. He will direct the blows of his battering rams against your walls and demolish your towers with his weapons. His horses will be so many that they will cover you with dust. Your walls will tremble at the noise of the war horses, wagons and chariots when he enters your gates as men enter a city whose walls have been broken through. The hooves of his horses will trample all your streets; he will kill your people with the sword, and your strong pillars will fall to the ground. They will plunder your wealth and loot your merchandise; they will break down your walls and demolish your fine houses and throw your stones, timber and rubble into the sea. I will put an end to your noisy songs, and the music of your harps will be heard no more. I will make you a bare rock, and you will become a place to spread fishnets. You will never be rebuilt, for I the Lord have spoken, declares the Sovereign Lord."

What we discover is the following: [19] [20]

Tyre involved both a mainland city and an island city.

- Many nations attacked and conquered Tyre over the years, including Babylon, Greece, Rome, and Saracen invaders.
- Nebuchadnezzar himself attacked Tyre from 586-573 BC, setting up a siege. The island city was never captured.
- In 332 BC Alexander the Great defeated Tyre, building a causeway to the island with debris from the city thrown into the sea.
- Eventually the original city was obliterated, leaving the rocky coast used today by fishermen.

Babylon

Isaiah 13:20-22 tells us about Babylon-

It will never be inhabited or lived in for all generations; no Arab will pitch his tent there; no shepherds will make their flocks lie down there. But wild animals will lie down there, and their houses will be full of howling creatures; there ostriches will dwell, and their wild goats will dance. Hyenas will cry in its towers, and jackals in the pleasant palaces; its time is close at hand and its days will not be prolonged.

What we find today is this:

Two millennia of looting and warfare reduced Babylon to the barest of ruins. In the early 20th century, German archeologists recovered remnants of the Processional Way and reconstructed its blue-glazed tile murals at the Pergamon Museum in Berlin. It was Saddam Hussein who took up Nebuchadnezzar's mantle and tried to reconstruct some of Babylon's former glory but ended up with what art historians decried as "Disney for a despot." ... Babylon itself is mainly a ruin..." [21]

Many of the Biblical prophecies can be linked to very specific dates and places: [22][23]

Prophecy	Fulfillment
Ammon - Jer. 49:1-6	Severe destruction, later rebuilt (Today: Aman, Jordan)
Assyria (Ninevah) - Nahum 1:8, 2:6	Attacked with river flooding city; destroyed 612 BC, some museums there today
Babylon - Isa. 13:19-22, Isa. 47	Attacked by Assyrians and rebuilt, attacked again by Babylon
Damascus (Syria) - Isa. 49:23-27, Isa. 17:1-3	Attacked by Assyrians and rebuilt, attacked again by Babylon
Edom - Isa. 34:6-15, Jer. 49:15; Ezek. 25:12-14	Attacked by Babylon 605 BC, Edom would become a barren wasteland (region of Petra)
Egypt - Jer. 46:1-12; Ezek. 30;13-15	Thebes destroyed with fire; major siege and destruction 89 BC, Egypt's army defeated at Carchemish - 605 BC - never again a major world power

Prophecy	Fulfillment
Elam (southwestern Iran) - Jer. 49:34-39	Attacked by Babylon c. 594 BC; became province of Persia, sent colonists to Samaria
Israel (Northern Kingdom)	Fell to Assyria, 722 BC
Judah (Southern Kingdom)	Fell to Babylon, 587 BC
Moab - Jer. 46	Destroyed 582 BC by Babylon
Persia - Isa. 44-45	Cyrus the Great (539 BC) named as the leader who would authorize the return from captivity and rebuilding the temple
Philistia - Jer. 47	Ashkelon captured by Babylonians 604 BC - ruins remain near a modern city
Sidon - Ezek. 28:22-23	25 miles north of Tyre; Conquered by Babylon, later rebuilt
Tyre - Ezek. 26:1-14	Besieged by Nebuchadnezzar, 587-573 BC, later by Alexander the Great
Succession of Kingdoms Danile's interpretation of the statue dream - Daniel 2	Babylon, Medo-Persia, Greece and Rome became major empires in turn
Fall of Jerusalem (Jesus' prophecy)	70 AD - Attack by Roman general Titus - slaughter of many, destruction of the temple

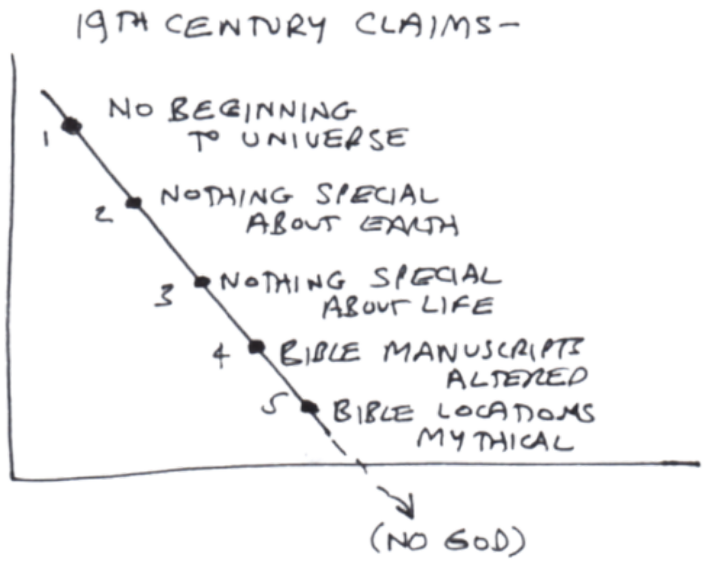
The curious case of Velikovsky

One very non-traditional area of apologetics involves the writings of the controversial science writer Immanuel Velikovsky (Worlds in Collision). [24] Velikovsky's position was that numerous catastrophic events occurred in the distant past, all caused by astronomical anomalies (which is not the position of the Bible or Bible scholars). The Tower of Babel is related to space debris from Mercury, Sodom and Gomorrah to Jupiter, and Joshua's long day also to Jupiter. [25] The deluge (great flood of Genesis 6) was caused, he suggests, by proto-Saturn ejecting

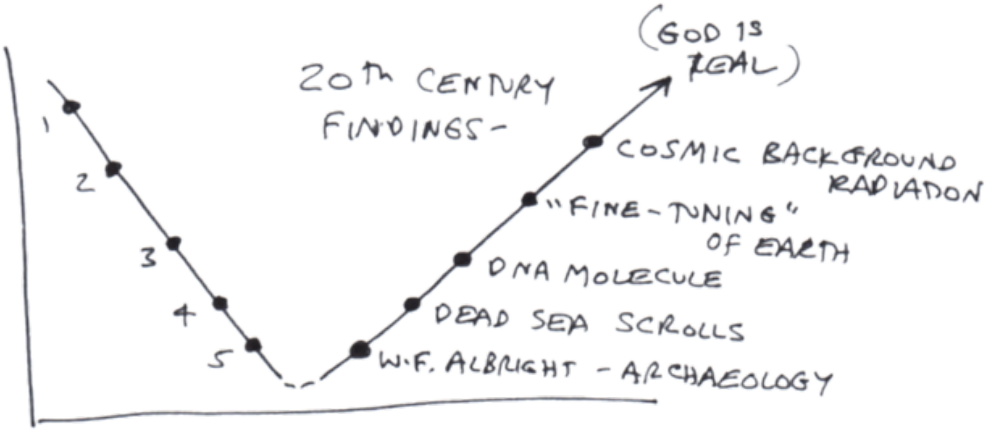
significant mas into space. While nearly everyone rejects his theories, the valuable contribution of Velikovsky was actually his research into folk stories from around the globe. Since over 120 flood stories exist from all parts of the world one conclusion might be that there was an actual flood event long ago that prompted these stories. The Bible provides a supernatural but non-mythical narrative for the flood and other unique events.

WHEN THE CURVE TURNED AROUND (BY BILL)

Had we been plotting major data and trends through the 19 th century it would certainly have appeared discouraging. Most of the popular thinking was moving towards a conclusion that there was no Creator God:



In the 20 th century, however, the direction reversed as many findings and writings now pointed towards the reality of God and the Scriptures:



CONCLUSIONS

While no single piece of data conclusively makes the case for God and the Scripture, a large body of evidence is available and must be dealt with.

Evidence alone isn't sufficient to bring a person to Christ. The Holy Spirit must also be at work to convince, to convict of sin, to convert. (John 16:8) Only the Holy Spirit can change a heart.

However,

- The evidence, taken together, has a very strong weight.
- The evidence includes objective historical data, rational coherence of Scripture, explanatory power of the message, and person experience.
- The evidence comprises a compelling case that faith in Christ is warranted.
- The evidence knocks down smoke-screens against the Gospel.
- The evidence is consistent with the reality/existence of the God of the Bible.
- The combined weight of all of the evidence is consistent with the Biblical message and points unmistakably to the Christian faith.

In addition, says Frank Turek [26] every major argument made by atheists has as its foundation essential ideas from Christianity:

1. Causality - Cause and effect is essential- until it gets down to the cause of the universe and physical laws.
2. Rationality- Why should mere matter correspond to actual truth?
3. Intentionality- Why should humans have free choices if all mental activity is biochemical?
4. Morality- What does morality mean without a fixed moral standard?
5. Evil- How can we speak of good and evil if all actions are only the interactions of matter?
6. Science- Why are the physical laws so dependable?

Most individuals never explore fulfilled prophecy or manuscripts or archaeological findings but instead are convinced of the truth of the Christian message simply by what they observe in their daily life. Significant evidence is available to any who will look:

- The existence of earth, sun, moon, and stars
- The power of Scripture
- The changed lives of believers (power of the Holy Spirit)
- Examples of answered prayers (power of the Holy Spirit)
- Love shown by Christians (John 13)
- Good works done by Christians (Mt. 5)
- The unity of Christians (John 17)
- The convicting message of Scripture –"All have sinned"

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CHAPTER 8: WORK, PROFESSION, & VOCATION

INTRODUCTION

Most of us will spend 40 or more hours per week at work for most of our adult life. Our attitude towards work will critically affect how we work.

So- Why do you work?

Jack: “To earn money for the weekend. I live for the weekend.”

John: “To make ends meet. It’s boring and repetitious, but I’ve got to handle the bills.”

Jill: "It gives me a sense of purpose. A raise or a promotion is a huge ego boost."

Jim: "I'm saving for retirement. At 65, I finally won't have to work. Hopefully, I'll live past 65."

Julie: “To earn money to give to church and missions. That’s all that really matters.”

Could there be more to work than these responses?

With BS or higher degree in hand, the newly minted engineer has (hopefully) been prepared for this moment- entering the field of work. For the Christian engineer, this sometimes poses a dilemma: How can I be "sold out for Christ" and desiring the things of God's Kingdom and at the same time pour myself into my daily work, which is typically very secular?

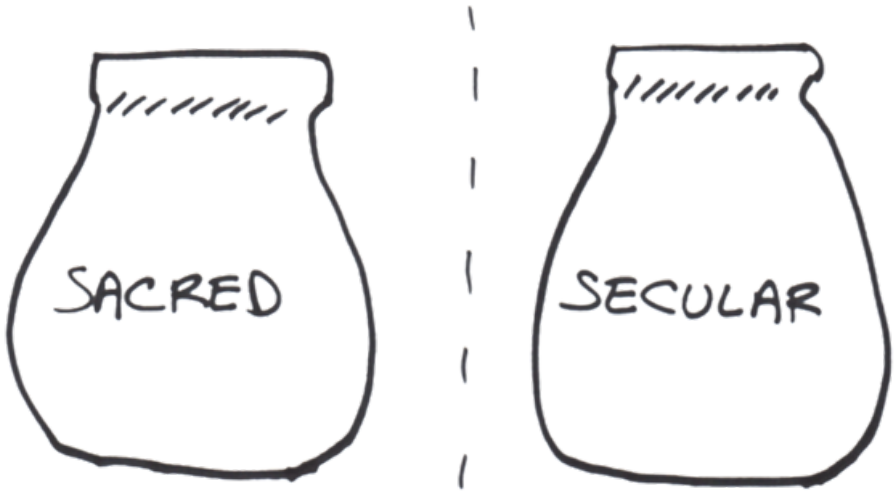
The majority of Americans see no connection between their faith and their work (ref-Ross West book). Believers might say that they should work honestly and diligently, earning some money to give to the Lord's work, but that's as far as the thinking goes. After all, God's work is spiritual, and our 9 to 5 work is secular, right? How do we deal with the "sacred" (or "spiritual") and "secular" parts of life?

THE TWO-POT SYSTEM (BY BILL)

Let’s look at what I call the Two-pot theory of Christianity.

Consider two pots. Label them "secular" (on the right) and "spiritual" or “sacred” (on the left). In this system, we divide our lives into two categories. In the secular category are such things as eating, sleeping, working, going to class, doing homework, washing dishes, mowing the

lawn, dating, playing with your kids; in short, all those things that God doesn't care a whole lot about - "secular things". In the Spiritual Pot are important things - prayer meetings, going to church, witnessing, Bible study, counseling (if it's about spiritual matters), and in general those things about which God is concerned.



Now, consider the possible decisions you make as you travel through life. There are three kinds: secular-secular, spiritual-spiritual, and spiritual-secular; I'll explain.

A secular-secular decision is one in which you choose between, say, straightening your room and doing the dishes - any two items out of the pot marked "secular". Since God doesn't care which one you do, there are no eternal consequences to your decision - just practical consequences; like, your dishes might get all used up & the kitchen would begin to stink, or you might eventually need a compass to find your desk. However, nobody will roast in hell because of it.

Although there are eternal consequences to which choice you make in a spiritual-spiritual decision, you're still doing something for God either way. At least, you're not wasting time doing something secular. It's either going to Bible study or church, and God likes for you to do both of those things.

The real problem comes with the spiritual-secular decisions: they determine what you're made of. Naturally, God would rather that you always choose the spiritual thing to do, if you want Christ to be Lord of your life; go to a Bible study instead of doing homework; witness instead of mow the lawn; go to church instead of taking your wife on a date.

This, however, leads to a problem. You can handle the first two kinds of choices, but if you do the "right thing" in each case where you have the third choice, after a while, your life will be filled with spiritual things, and you'll have no time for anything practical. You'll feel like you're wasting your time unless you're witnessing or praying.

Nevertheless, somebody has got to do the practical stuff, so we have Full-Time-Christian-Workers (pastors & missionaries) on the one hand and laypeople on the other. The FTCWs do

spiritual things, & the laymen do practical things, like work, to earn money to give to the former so they can do important things. We thus have ordinary people and FTCWs - if you really want to serve God, you become a FTCW. Otherwise, you're just an ordinary, practical layman. In other words, a part-time Christian.

I hope that, by this time, it's become obvious that I'm being facetious. The Christian life is not a two-pot system - it's all in one pot! There are not spiritual and secular categories. "Whatever you do, do it to the glory of God" (Col.3:17, 23).

The problem is not solved, however, by merely realizing this fact. It must be implemented in your life - and from dealing with students brought up in Christian homes, I know that, although many give lip service to a one-pot system, most live in a two-pot system. This is evidenced in subtle ways.

As I talked with a young pastor, he commented that he was taught in seminary that you should never allow yourself to be caught without a tie by your parishioners. "It destroys your image, and you lose their respect", he was told. Another graduate said that his seminary told him to "make sure you only choose people who agree with you to be on your board of elders. Then your church will run smoothly". In both of these cases, the clergy-laity barrier is built up.

The latter advice cultivates a pastor-dictatorship, which can only be maintained in a two-pot system (when a pastor says, "I'm the pastor, so we'll do it my way", the statement can often be translated as: "I am spiritual; you are only a layperson; therefore you are not qualified to advise on spiritual matters"). However, we are clearly taught that we are all priests in I Peter 2:9.

It may seem that a one-pot system does away with all categories. This is not true. Paul teaches in I Cor.12-14 that we are all one body but have different functions. This means we specialize in certain things, such as teaching, giving, engineering, or ditch-digging, but all the jobs are equally spiritual.

Here are some results of two-pot thinking:

1. If you're a "part-time Christian", that means some Christians can just have Christ running part of their lives, and others (FTCWs) are sold out and have Jesus as Lord of their whole lives. Of course, if this is true, then if a member of the laity gets "sold out" to Christ, he must quit his secular job & become a FTCW. This, therefore, leads to the doctrine that you can be a good Christian without having to be totally dedicated to Christ.

2. Since FTCWs are not ordinary people, who do practical things, they can't relate to real-world problems. This makes sermons ethereal and impractical, "but that is okay because you can't expect the laity to grasp these higher things, anyway". Thus, a communication gap develops between FTCWs and the laity. Notice that the Pharisees had this same attitude in John 7:48 - "Have any of us (the clergy) believed on Him? But this people who know not the law (the laity) are accursed".

3. The responsibility of a layman in evangelism is to bring non-Christians to church. Where the pastor "gets 'em saved." One of the more zealous ones may lead someone to Christ but will then turn him over to the church for proper training (usually consisting of an exhortation to go to church regularly). On the other hand, Matt. 28:19, 20 tells us that our task is to preach the

gospel and teach and baptize the new converts. Those who lead people to Christ also are responsible to disciple them. They can't slough off their responsibility on some "full-time, authorized" person. Furthermore, they are best suited to that job themselves; they can best relate to the new believer because they have learned to apply spiritual principles to everyday working and living situations. A draftsman can best show another draftsman how to live as a Christian draftsman.

4. Two-pot Christians tend to be fickle in their relationships with people. Because a continuing relationship is not as crucial as "reaching new people for Christ." Since evangelism ranks high on the list of "spiritual things", there tends to be a compromise - even sin - toward the end of witnessing. The argument goes something like this: "I try to be a regular guy around them, so I can show them that Christians aren't a bunch of nerds; but later on, I'll talk to them about The Lord". Fine, as long as you don't compromise your principles, but many do. Can you sin in order to bring about God's will? No way! The sad truth is that since those niceties contribute to a deep, long-term friendship (such as helping someone with homework or going out to a movie together). Are considered a secular waste of time. A two-potter finds it hard to form a lasting friendship with a non-Christian. Thus, evangelism becomes a guilt-motivated shotgun approach to strangers instead of the natural sharing with friends, known as "friendship evangelism," that it ought to be.

5. Since secular work is counted second-best, there is little incentive to work conscientiously. Why do your homework when it is "all gonna burn" anyway? A two-pot mentality is largely responsible for the strain many students feel about "dividing the time" between schoolwork and spiritual activities. They are intimidated by the statement, "How can you sit there doing homework when people are going to hell?"

6. There is a tendency to live and think spiritually on Sunday but worldly on weekdays. Similarly, people tend to walk, talk, and dress differently in the church building than anywhere else in society. Some ministers have a different, "reverent" voice behind the pulpit.

7. Art and music must have "spiritual" themes to be acceptable by two-potters.

8. The abortion issue, laws affecting the family, and poverty all become "worldly and political" and thus not worthy of discussion at church.

9. There is no place for tentmakers (those who, like Paul in Acts 18:3, support themselves by working at some "secular" profession in a foreign country as they witness on a one-to-one basis by their Christian lifestyle). In world missions; only "church-planters." The goal of these mission efforts is to establish church buildings and Sunday worship services in all cultures, not to integrate the gospel into every aspect of the people's lives.

10. Students planning to become FTCWs - "preparing to serve God" - can endure their studies, looking forward to a time when they'll be doing something "worthwhile,"; but on the mission field, they will find it's still real life. They continue to wash dishes, and in fact, the "secular" jobs will probably take even more time than they did before. This all results in frustration; "when will I ever be able to spend my time doing worthwhile things?" After all, that time spent anticipating a fulfilling lifestyle, they become disillusioned.

The two-pot system is actually very like the old Gnosticism, in which the body and everything physical was considered evil and the spirit good. Therefore, Gnostics concluded that Jesus could not have actually come in the flesh but was only a spirit. John writes (in I Jn. 4:3) that this is a doctrine of antichrist.

Let's look at some of the practical, positive aspects of a one-pot system. Naturally, there is a positive counterpart to each of the items listed above; but some unexpected consequences also come up.

For example, as a two-pot Christian tends to think you can be a "good but not totally dedicated" Christian, he develops a "mortal" & "venial" system of categorization for sins. The rules for "full-time" Christians are more stringent than those for "laity" - for whom some things are just "mistakes". You hear talk of God's "perfect will" for your life or His "permissive will". This is allowed in a two-pot system, but in the one-pot way of thinking, there is another term for "permissive will" - you call it "sin".

To emphasize this, consider the following dialogue: God says to you, "I want you to quit your study of accounting and become a missionary to Liberia". You retort, "No, God, I don't want to. Give me your second choice". If God's "permissive will" is not sin, then this little dialogue is permitted; but to shout "no" in the face of the LORD God Almighty sounds like a sin to me.

On the other hand, a one-pot Christian realizes that God could as easily ask him to choose accounting as missionary, and life as an accountant may be God's perfect will for him. Accounting could never be God's perfect will for anybody in the two-pot system because it's not a "spiritual" job. Is it hard for you to believe that God would "call" someone to be an accountant? Maybe there is a two-pot leaning in your theology.

The one-pot system of thinking can help you to do your homework and other work more conscientiously. Since you are doing it for God instead of your professor or supervisor (Col. 3:22 says that we should serve those who are set over us, knowing that God is watching us, and to please Him, therefore). You do not have as great a temptation to cut corners where your supervisor won't see the results. You become a God-pleaser instead of a man-pleaser.

The transition from a two-pot to a one-pot system takes time. It is a way of life rather than a change in the doctrinal statement, much as Brother Lawrence's "Practicing the Presence of God"; the concept slowly oozes into your life. I still catch myself mumbling, "what a waste of time," as I get frustrated by a problem I've assigned to my students, but then I stop and re-evaluate: "has God called me here? Am I doing this for man's acclaim or His?" I'm reminded that I need God's help to do God's work, which reminds me, in turn, to pray for direction in working the problem and then go back to working it. I usually find renewed motivation and, in time, a sense of fulfillment.

Many times Satan bugs you with the idea, "this is a waste of time. You should be out doing something spiritual". The key to recognizing that it's him is that there's usually no specific alternative, just a general "Something Spiritual" rather than "this useless secular stuff".

A word of caution - you can use your "one-pot stand" to avoid responsibility to God. All things are not equally important; remember that God has a program for the world, and our lives are to conform to that program - He wants people to be born into the kingdom of God through

faith in Christ and then to grow spiritually. Whatever we do will eventually contribute to these ends if we are in God's will; however, the means are not justified by the ends. You can easily pervert "whatsoever you do, do to the glory of God" to "whatsoever you do is okay". We need to seek God's will and keep from sin.

If you adopt the one-pot view, you will find that traditionalists look down on you, and you will have to stand against the current of tradition in the Christian subculture. There may even be times at which you will have to say, "Since I've been busy so many evenings, I think The Lord would have me to stay home with my wife & kids tonight instead of going to prayer meeting". You will probably be termed "unspiritual" by many well-meaning friends. However, remember, Jesus said that some of our opposition would come from within the church (Jn.16:2).

On the positive side, though, the one-pot system allows you to say, at the end of a day, "I did a good job today", even if you are not a "Full-Time Christian Worker".

SACRED-SECULAR (BY PAUL)

Most believers have learned that "what's done for Christ" is essential. Obviously, worship (from a thankful heart) and sharing the Lord is done "for Christ." What about our daily activities? Our work and family activities should be done for Christ since all of life is lived before the Lord.

For the believer, all of life is sacred; all is to be lived for God.

"And whatever you do, whether in word or deed, do it all in the name of the Lord Jesus, giving thanks to God the Father through him...Whatever you do, work at it with all your heart, as working for the Lord, not for human masters, since you know that you will receive an inheritance from the Lord as a reward. It is the Lord Christ you are serving." (Col. 3:14, 23, 24)

"Whether therefore you eat, or drink, or whatever you do, do all to the glory of God." (I Cor. 10:31)

We don't have to be doing religious things to glorify God. Even a daily action as mundane as eating and drinking can be done to God's glory. Whenever we use our God-given talents to please God and bless others, we can glorify God. Recall Olympic runner Eric Liddle's statement, quoted in "Chariots of Fire.": "I believe God made me for a purpose, but He also made me fast. And when I run, I feel His pleasure." [1]

The sacred-secular divide is, unfortunately, a myth. There are not two pots or buckets labeled "sacred" and "secular" to categorize all the activities of life. There is only one pot. At first, this idea sounds irreverent, but it actually is both liberating and glorifies God most if appropriately understood.

If there is an actual sacred-secular division, then (1) secular work is strictly second-best, (2) work is only valuable as a means to earn money for spiritual efforts, (3) there is little incentive to do excellent work in the "secular" realm, and (4) six days of the week are nearly wasted, and only Sunday is valuable.

On the other hand, if all can be done for God's glory, then all of life becomes sacred, including work and including engineering.

"*R. G. LeTourneau wrestled with the secular versus full-time Christian work idea. LeTourneau was a successful businessman in the early 1900s who recounts the turning point in understanding how God desires to use business for His glory. His pastor one day said to him,* "*You know, brother LeTourneau, God needs businessmen as well as preachers and missionaries.*" "*Those were the words that guided my life ever since,*" *said LeTourneau.* "*I repeat them in public at every opportunity because I have discovered that many men have the same mistaken idea, I had of what it means to serve the Lord. My idea was if a man were going all out for God, he would have to be a preacher, or evangelist, or missionary, or what we call a full-time Christian worker. I didn't realize that a layman could serve the Lord as well as a preacher. I left the parsonage in sort of a daze. If God needed businessmen, he could certainly find a lot better material than a dirt-mover with many debts piled up in the garage business. But I said, 'All right if that is what God wants me to be, I'll try to be His businessman.'" [2]*

Faith and our skills work together:

"Faith assists us in discerning what is "the highest and best use of one's God-given talents--talents that impose responsibilities even more than they provide means of achievement, satisfaction, and recognition." [3]

In First John 2:15, we are told not to love the world or the things of the world. This is often taken out of context to suggest that everything on earth is to be despised. Immediately afterward; however, we are shown what these "things of the world" are: "the lust of the flesh, the lust of the eyes, and the pride of life." (verse 16)

These are the things we are not to love. John does not exclude the enjoyment of God's creation and all its beauty, nor even the enjoyment of man's creation-music or painting-nor even the enjoyment of physical experiences in general, such as eating and drinking. He is merely excluding a wrong attitude that does not honor God and fails to see that God is the ultimate origin of everything, the one who gives significance to all of life. Such experiences are wrong, not because they have taken place literally "in the world," in the sphere of physical reality, but because of lust and pride. [4]

DANGERS OF DUALISM

Dividing the world into two separate categories is known as dualism and usually gets us into difficulty.

According to Naugle [5] dualism comes in multiple forms, all of which suggests that life on earth is a second-class existence:

- Body (bad), soul (good) (Plato)
- Temporal (bad), eternal (good)
- Matter (bad), spirit (good) (Gnostics)
- Secular (bad), sacred (good)

Consider where dualism can lead (in addition to those mentioned above):

- In homes- neglect repairs and maintenance, neglect landscaping and decorating.
- In friendships- keeping friendships only with prospective converts.
- In social settings- having no "common ground" with others.
- In learning-reading only spiritual literature
- On the mission field- caring only for souls and neglecting bodies (food, medicine)

WORK AND THE FALL

Christians sometimes suggest that work is a result of the fall. Since work sometimes feels like drudgery, could that mean that work is part of the fall? Genesis 1 -3 describes the world before and after the Fall. Is work part of the fall/curse?

This is a mistaken idea for several reasons:

1. Adam did meaningful work (tending the garden) before the Fall. (Gen. 2:15)
2. The Dominion covenant was given before the Fall. (Gen. 1:28)
3. The ground itself was cursed, not the working which involved the ground. (Gen. 3:17-19)

Work is not inherently a curse but rather a good gift from God affected by the Fall. As Dorothy Sayers states, "... work is not, primarily, a thing one does to live, but the thing one lives to do. It is, or it should be, the full expression of the worker's faculties, the thing in which he finds spiritual, mental, and bodily satisfaction, and the medium in which he offers himself to God." [6]

Was Adam a co-creator with God? Clearly, Adam was not completing the creation of the physical universe. It was complete and good when God "rested." Adam was doing meaningful work, given by God, valuable for him to do. On the other hand, he was extending creation as he used this world's materials in new ways. There is incredibly much more on the earth than in Adam's day as humans "filled the earth."

Like most aspects of life, work was changed after the Fall. “Working by the sweat of your brow” became a literal reality. Work became toilsome and difficult. To some, it seemed meaningless. All aspects of human sinfulness entered into the work environment. Work itself needed redemption. Everything changed with Christ’s death and resurrection.

Work itself has value for several reasons- [7]

- Work creates a culture that honors God and allows people to thrive.
- Through work we make ourselves useful to others.
- Work is an indispensable component in a meaningful human life.
- Work is a mark of human dignity.
- Work is a part of culture-making.
- Work is service to others.
- Work is an act of love.

Unfortunately, sin distorts work (and relationships, sex, leadership, everything.) [8]

Work is not ultimate fulfillment but carrying out one's work well can be a fulfilling-type activity.

Work may be difficult and have unpleasant parts, but there should be a sense of accomplishment in work done well.

ENGINEERING WORK - A PROFESSION

Like law, medicine, and nursing, engineering is a profession. A profession has these characteristics:

- It requires specialized knowledge/education.
- It exists to serve the public.
- It has a specific code of ethics.
- It involves public licensing.
- It openly presents its discoveries in publications to advance the field.

What does one "profess to" in becoming a member of a recognized secular profession as engineering? Answer: Three things - 1) that one has extensive knowledge, skills, and ability in some specialized, largely intellectual, field of human endeavor; 2) that one will apply that knowledge, skills, and abilities under the profession's code of ethics; and 3) that one accepts the jurisdiction of the profession over one's professional competency and ethics. [9]

Carson gives the following summary of professions:

The two primary purposes of (secular) professions are to 1) advance the professional interests of its members and 2) advance the common good by advocating and advancing the art, science, and ethics underlying the profession's practice and its service to society.
Essential attributes of a (secular) profession: 1) The profession "holds its own gates" - it admits its new members, being a member is a privilege that can be removed for cause, 2) it is mainly self-regulating - the profession gets to make the rules for itself regarding its internal operation, its standard of care, its code of ethics is, and how they are implemented.

Professions are largely self-regulating with two fundamental purposes that exist in tension - to advance the professional interests of its members while advancing the common welfare via the trustworthy - ethical, competent, and accountable - practice of the profession. [10]

Additional contributions of engineers to society involve our place in public policy:

Among engineers' contributions to society, the place of advocacy for public policy issues is a role that is not professionally required but has been taken seriously by several engineers. Engineers are a source of valuable input to policy decisions because they are used to pointing out both the costs and the benefits of a given course of action. For example, in the area of energy savings, many in government have pushed for the development of more fuel-efficient cars, which is a reasonable goal. The most obvious response of the automakers will be to

cars, which is a reasonable goal. The most obvious response of the automakers will be to design smaller and lighter cars. Engineers realize that decisions come with trade-offs and consequences. Smaller, lighter cars do not survive accidents as well as earlier cars. The accompanying result may be a higher incidence of injuries and deaths. [11]

Engineering is considered a serving profession since the results of our work often benefit the public directly. This is particularly true in providing such things as roads, clean water, and medical devices. Servanthood is certainly a mindset taught in Scripture.

ENGINEERING - A VOCATION

Like all legitimate work, engineering is also a vocation, or "calling." Unfortunately, the term "vocation" has come to mean simply our "occupation." Historically, the concept was developed that God calls us to a life with Him, and, simultaneously, to an area of work. The development of this concept goes back to the days of Martin Luther and the Reformers.

Os Guinness, in *The Call*, states that "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." [12]

Many Christians hold that God "calls" people to their occupations, primarily through the talents and interests they already possess. God "calls" people to certain occupations, primarily by gifting them in certain areas. Engineers have some aptitude for math and science and an interest in practical applications. Not everyone in high school who has math and science skills and enjoys learning how things work would enjoy being an engineer, but it is difficult to imagine someone succeeding in engineering without these traits.

The believer actually has three callings:

1. We are called to salvation and to the Kingdom of God, to enter His family and follow Him.
2. We are called to the Body of Christ and to minister to others there through the gifts and opportunities God has given us. Some will be apostles (missionaries), evangelists, teachers, leaders, and servers.
3. Finally, we are called to serve others in everyday work through the talents and skills God has given us. Some will be builders, cooks, technical experts, business people, repair people, nurses, teachers, artists...all part of God's "common grace," and all part of God's gifts to the world.

"A job is a vocation only if someone else calls you to it and you do it for them rather than for yourself." [13]

We are not so shocked when a person claims to have a "calling" to the pastorate, or the priesthood, or social service, or to missionary work, or to education, or even medicine, because these are just the sorts of occupations God would call one to. But engineering? "Is engineering the sort of occupation to which God might call someone? And if so, why? [14]

Yes, says Brad Kallenberg, and for these reasons: [15]

1. Engineering fits with God's intents: It blesses people, helps reduce the negative impacts of the fall, assists the poor, and aids in transmitting the Gospel. (More on this in chapter 10)
2. Engineering, like medicine, brings about good ends by good means.

Would God specifically give to an individual talent in a technical area? Absolutely, according to scripture.

Exodus 31:6, 36:2, and 38:23 tell us about Bazalel and Oholiab, two skilled persons to whom God had given special abilities, identified for overseeing work on the construction of the tabernacle. Vinson notes that Bezalel was the first person in the Bible said to be "filled with the Holy Spirit." [16]

Vocations as "the masks of God"

Many current writers, even non-believers, discuss the value of "calling," but the notion of calling really originated from Christian sources. In fact, calling makes little sense unless there is a "Caller." Calling does not mean that your entire life is scripted, but rather that God has a plan best suited for you.

Just as there are many parts to the body (yet one body) and many gifts of the Spirit (but one Lord), all distributed by God (I Cor. 12). Similarly, there are a variety of vocations, all of these part of the matrix of society and all necessary for the full picture.

While God could provide food miraculously (manna in the wilderness), judge crimes miraculously (the case of Achan), or create clothing miraculously (animal skins for Adam and Eve), He turns all of these areas over to people.

God works through people in ordinary work to bless others. Martin Luther explained that God blesses people in their daily lives disguised as a farmer, a baker, a shopkeeper (and, we might add, a plumber, a nurse, an engineer, or a programmer.)

Luther puts it even more strongly: Vocations are "masks of God." On the surface, we see an ordinary human face — our mother, the doctor, the teacher, the waitress, our pastor — but beneath the appearances, God is ministering to us through them. God is hidden in human vocations.

The other side of the coin is that God is hidden in us. When we live out our callings — as spouses, parents, children, employers, employees, citizens, and the rest — God is working through us. Even when we do not realize it, we, too, are masks of God when we fulfill our callings. [17]

When we pray the Lord's Prayer, we ask God to give us this day our daily bread. And he does. He gives us our daily bread through the vocations of farmers, millers, and bakers. We might add truck drivers, factory workers, bankers, warehouse attendants, and the lady at the checkout counter. Virtually every step of our whole economic system contributes to that piece of toast

you had for breakfast. Furthermore, when you thanked God for the food He provided, you were right to do so.

God protects us through the vocations of earthly government, as detailed in Romans 13. He gives His gifts of healing, usually not through out-and-out miracles (though he can) but through the medical vocations. He proclaims his word through human pastors. He teaches through teachers. He creates works of beauty and meaning through human artists, whom he has given particular talents.

For a Christian, conscious of vocation as the mask of God, all of life, even the most mundane facets of our existence, become occasions to glorify God. Whenever someone does something for you-brings your meal at a restaurant, cleans up after you, builds your house, preaches a sermon-be grateful for the human beings whom God is using to bless you and praise him for his unmerited gifts. Do you savor your food? Glorify God for the hands that prepared it. Are you moved by a work of art, a piece of music, a novel, a movie? Glorify God who has given such artistic gifts to human beings. [18]

Each believer is equipped by God for an occupation to bless society at large and spiritually equipped/gifted to bless the church. Just as spiritual gifts provided to Christian men and women for ministry are Christ's gifts to His church, similarly the skills God gives us for work are Christ's gifts to a community, part of His "common grace."

At present, we have no clear grasp of the principle that every man should do the work for which he is fitted by nature. The employer is obsessed by the notion that he must find cheap labor and the worker by the notion that the best-paid job is the job for him. Only feebly, inadequately, and spasmodically do we ever attempt to tackle the problem from the other end and inquire: What type of worker is suited to this type of work? People engaged in education see clearly that this is the right end to start from: but they are frustrated by economic pressure and the failure of parents on the one hand and employers to grasp the fundamental importance of this approach. [19]

WORK AND THE REFORMATION

Most great people in the Bible ("Bible heroes") had regular, "non-spiritual" jobs:

- Joseph worked at sheep ranching as a young man, then government work in Egypt.
- Moses cared for sheep in Midian for forty years.
- David was a shepherd and later a king.
- Nehemiah was a royal cupbearer, later manager of a building project.
- Lydia had a textile business.
- Matthew worked for the IRS (Israeli Revenue Service)

In medieval times ordinary work was seen as a hindrance to a relationship with God. When Martin Luther discovered God's grace, he concluded that a sincere Christian could serve God fully in any kind of work (except, he added, as a user, a prostitute, or a monk.) Since we can love God with all our heart and work with all our heart (Col. 3:23), we can love God through our work...Calvin added that people were created to be employed in labor of various kinds.

Our work is of no value in our standing before God but is of inestimable value in giving God's bounty to the world. [20]

Martin Luther was once approached by a working man who wanted to know how he could serve the Lord. Luther asked him, "What is your work now?" The man replied, "I'm a shoemaker." Much to the cobbler's surprise, Luther replied, "Then make a good shoe and sell it at a fair price." He didn't tell the man to make "Christian shoes." He didn't tell him to leave his shoes and become a monk. As Christians, we can serve God in a variety of vocations. Furthermore, we don't need to justify that work, whatever it is, in terms of its "spiritual" value or evangelistic usefulness. We simply exercise whatever our calling is with new God-glorifying motives, goals, and standards. [21]

Naugle writes:

(The Reformers and Puritan writers) defined work in this way: the social place where people can exercise their God-given gifts in others' service as needy interdependent individuals. The main end of our lives . . . is to serve God in the serving of men in the works of our callings." A person's vocation is "a certain kind of life, ordained and imposed on men by God, for the common good." (William Perkins, Treatise on the Vocations or Callings of Men)

The primary purpose of labor is a matter of "obeying God and doing good to others. (Richard Baxter, A Christian Directory)

Hence, two practical aspects arise from this definition of work: giftedness and the exercise of those gifts for others' sake.

The ultimate criteria for job choice is not salary, security, status, or satisfaction, but SERVICE. Christians should "choose those employments which yield the greatest advantage to their neighbor." (John Calvin) [22]

At this point, we need to make a powerful warning- If a Christian is an engineer, he or she has embarked on a great profession and a noble vocation. However, that profession should never be mistaken for one's identity. One's identity is in belonging to Christ. If we forget this, we will certainly crash at some point.

I find it interesting that many countries have established governmental agencies termed "ministries" (Ministry of Health, Ministry of Education, Ministry of Commerce, Ministry of Agriculture...) It actually can be profitable to view all legitimate work as a specific ministry to people. Just as God continually ministers to us in areas of provision, protection, restoration, and guidance, we minister to each other through such vocations as -

- Agriculture- Ministry of Provision/food
- Carpentry and construction-Ministry of Provision/shelter
- Tailors and garment makers-Ministry of Provision/clothing
- Police work- Ministry of Protection
- Medicine, nursing- Ministry of Restoration/body
- Psychology- Ministry of Restoration/mind
- Pastoral work- Ministry of Restoration/spirit

- Engineering- Ministry of Restoration/ physical world
- Aviation- Ministry of Hospitality/transportation
- Restaurant work- Ministry of Hospitality/food

Calling and Purpose

Additional benefits to understanding our calling relate to the allied realm of understanding the purpose for which God made and called us. As a speaker on "the integrated life," Ken Eldred makes these points: [23]

- God had a purpose for each of the key people in the Bible, and God has a purpose for each of us.
- An integrated life means that we prioritize and integrate faith in Christ into all areas of life. All of life is then aligned under a common goal.
- We can and must discern God's purposes for us through His workmanship in us.
- God's "workmanship" includes our gifts, abilities, passions, personality, and experiences.
- We are accountable for what we build on His foundation (I Cor. 3), and God rewards faithful servants.
- Adhering to our purpose leads to focus, sustainability, and alignment.

In addition, we are most fulfilled in working when we operate within our calling.

Finding Your Calling

The knowledge that God has an optimum plan for a person sometimes leads to fear instead of joy: What if I miss it? How can a believer discover his or her calling?

Finding one's calling seems to be a subset of knowing God's will/direction. In that sense, the most critical first step is knowing God and walking closely with Him daily.

Principles behind finding your calling:

- Vocation is literally "a calling."
- A calling implies a Caller.
- Consider how God might call people,
- We usually think of God calling prophets or pastors. God clearly could call someone to be a builder or a craftsman.

How do people determine their calling?

1. Awareness of God-given skills, interests, natural talents, gifts, and passions. "What was I wired to do?"

If an incoming student tells me that he or she wants to study engineering and at the same time tells me that they can't stand mathematics and don't like to know how things work, I would suggest that they probably are not looking at the right major.

2. Talents recognized by others.
3. Recognition of a skill set needed to attack a given problem- medicine, engineering
4. Result of prayer and searching

NOT the occupation that will generate the most money

NOT the occupation that will provide the most prestige

The Theology of Work project encourages these considerations in discerning God's guidance to a particular kind of work: [24]

1. The needs of the world
"What needs to get done to make the world more like what God intended?"
2. Your skills and gifts
3. Your truest desire
4. Your freedom in Christ

Tippens offers several insights into God's call: [25]

1. Sometimes we choose our own vocation.

Our skills and passions in some areas (aviation, teaching, mechanics, art…) are clear to us and everyone.

2. Sometimes our vocation "chooses us."

God calls some to special tasks, and the faithful obey.

3. Vocation is discerned through careful listening.

Wisdom, spiritual discernment, and prayer should be part of our life in seeking to know God's will.

4. A true vocation is costly.

Discipleship is costly. "While there can and should be great joy in following one's true vocation, be on guard when an apparent call turns out to be a mere variation of the American Dream-the promise of more money, more prestige, and more creature comforts."

5. Your vocation began before you were born.

God's design of us includes our skills and giftings. (Eph.1). "Our identity encodes our vocation."

6. Vocation does not protect us from doubt or failure.

Even John the Baptist, who had followed God's directions faithfully, momentarily wondered if he had gotten it right when he found himself in prison. (Luke 7)

These guidelines were given by Crow and Zack: [26]

- The task is to figure out the next step, not your whole life.
- There needs to be a willingness to be comfortable with uncertainty; we can not lock down our future in advance.
- God will not ask us to do something that is fundamentally contrary to our nature.
- Our call needs to be discerned apart from what others (parents, professors, peers, etc.) think our call should be.
- God uses us where we are. Vocation is not as simple as finding one right path for our life, and if we make a mistake, our life is then ruined. This fear of making an error seems to be at the root of many students" paralysis–that is, they think it is better not to choose than to choose wrongly.

Thompson and Miller-Perrin discuss finding our vocation in terms of self-analysis coupled with active listening to God's voice and looking for areas to meet human needs:

Frederick Buechner eloquently describes this view in Wishful Thinking, stating, The place God calls you to is the place where your deep gladness and the world's deep hunger meet" (San Francisco: Harper San Francisco, 1993). Concerning the common element of giftedness, each of us is able to address the needs of the world uniquely through our specific gifts and abilities. Most sources on vocation emphasize the interplay between recognizing our gifts and talents and the process of discovering our self-identities. [27]

Students need to start somewhere – After praying for some wisdom. Pick a major and start studying it. Pick a job and start doing it. Realize that the first year or two on a job won't define your success. It takes at least a couple of years to get used to a job and begin to do it well.

What if I'm not working in the area of my studies?

- What if I'm retired?
- What if I'm laid off and find myself sweeping floors to pay the bills?

God's guidelines still apply–

- Whatever your hand finds to do, do it with all your might. Do all to the glory of God.

Keep things in perspective–
- Recognize the value in all valid work, including manual labor and raising a family.
- Work is important, but it's not the most important thing.
- Don't expect to find all ultimate fulfillment in your work.
- Don't look for your identity in your work. Your identity is in Christ.

WORK AND THE REFORMATION

For many, the idea of work lies at one side of a line–

LIVE FOR PLAY……LIVE FOR WORK

For Christians, the left-hand side (hedonism, playboy life) can't be right, so they gravitate towards the right-hand side and a workaholic lifestyle.

Neither is the goal of life. Instead, we need to look at a third, perpendicular, dimension, living to glorify God. Ministry, serving, often working, sometimes playing, are all lived out "before the face of God."

The Bible shows that God is still working (John 5:17) in contrast to one popular perception that now that God has gotten everything running, he is resting eternally. Throughout the Bible, we see different images of God as a worker, such as a gardener (Gen. 2:8), shepherd (Ps. 23), potter (Jer. 18:6), physician (Matt. 8:16), teacher (Ps. 143:10), vineyard-dresser (Isa. 5:1-7), and metalworker and refiner (Mal. 3:2-3; Ezek. 22:20), to name only a few. These are all rich metaphors drawn from almost every trade, craft, and role in human experience. God is as active and creative today- creating, sustaining, redeeming, and consummating - as he was when he began to make this vast universe. [28]

Several authors and teachers have developed ideas to construct a theology of work. The key points in a TOW include:

1. God "worked" to create the world, not that it was difficult, but that He deliberately made it happen.
2. God "rested from His work" (not that He was tired), indicating that it was complete and that He ceased from creation.
3. God's work is a model for us.
4. God often is described in scripture as some type of worker: Potter, Shepherd, King, Farmer, Vinedresser, Warrior, and Builder.
5. After the creation, God continued working but not creating brand new things.
6. Humans were designed to work. Work is part of God's plan for mankind. ("Man goes forth to his work and to his labor until evening." Psalm 104:23)
7. Work is part of God's plan for developing the world. [29]
8. Work existed before the Fall. Adam cultivated the garden, even though it apparently didn't take great effort.
9. We are designed to work and rest one day each week (part of the rhythm of life).
10. Work is not a result of the Fall. The ground was cursed (thorns and thistles), not work itself. Work is now more difficult. Hand farming takes place "by the sweat of man's brow."
11. God has designed us with skills for work.
12. Occupations mentioned in the Bible include farmer, herdsman, craftsman, shepherd, fig grower, counselor to the king, cupbearer to the king, musician, soldier, king, queen, fisherman, carpenter, and tentmaker.
13. Our work can please and glorify God.
14. Our work can bless others.
15. It is not mentally healthy for someone to do nothing.
16. A good worker adds value to his or her workplace.
17. A good worker is a blessing to his or her employer.

Fletcher Tink of Bakke Graduate University presents the following principles of theology of work: [30]

- In the Greek world, work was a curse, the province of slaves, not noblemen.
- God created the world but left some tasks for men to finish. Humans use God's resources and give added value to it.
- People were created to be stewards of the earth, of relationships, power, money, and resources.
- God gives gifts and direction for work and ministry.
- Joy at work results through finding purpose and using gifts.
- Christians act as co-workers with God in the world.
- Work is seen as worship.
- God as Trinity-Father, Son, Holy Spirit (Creator, Redeemer, Sustainer) -gives similar roles to His people. Christians are engaged in creative, redemptive, and healing work.

Keller adds the following: [31]

1. A Christian view of work is “that we work to serve others, not ourselves.”
2. We can indeed have "a thriving professional and balanced personal life." This is a Christian goal, not just a worldly goal (though, due to suffering and the gospel's priorities, sometimes it is not possible for some seasons - and that does not mean we are sinning or disobedient).
3. Excellence, integrity, discipline, creativity, and passion in the workplace all matter and are to be done as acts of worship — not just self-interest.
4. We are able to — and called to — serve God through the secular arena as well as the ministry arena.

In terms of Christ and work: [32]

- Jesus chose disciples who were workers.
- 122 of 132 of Jesus’ interactions with people occurred in the marketplace.
- Jesus redeemed work through His death.
- Our work has a purpose.

A faulty Theology of Work: [33]

- Divides Sunday from the rest of the week, secular from sacred lay from Clergy.
- Allows us to be Christian in Church, but someone else in other contexts.
- Limits God and His work to "within the walls of the Church" and fail to see God at work in everyday life.

Also- We need to avoid what Bob Mumford called the “short-timer’s mentality”: Jesus is coming back soon, so no sense working hard, teaching the next generation, protecting the environment, getting an education, building a career, or setting any long-term goals.

'*Short-timer*' *is a slang used by the military for men who had only a few days or weeks left in their enlistment and just sat around waiting for the end to come. For the most part, they were unreliable, disagreeable, and almost impossible to motivate for any useful work. The Lord's command to His disciples was 'Occupy (do Business) until I come back. (Luke 19:13) [34]*

WORK AND THE BIBLE (BY BILL)

Work in the Bible is significantly different from the current concept of work (just put in the time and get a paycheck.) Work in the Bible is a good thing. People are fulfilled. Work helps and serves an employer. Similarly, companies need to value employees.

As given in God's commandments, the OT concept of the Sabbath is a blessing to workers. The "company" in ancient Israel couldn't make people work seven days a week. Everyone in society legally had to take off one day every week.

Another idea that has a Biblical basis is a full day's work for a full day's pay. Anything less is essentially stealing from an employer. Note that mental work is also working, and should be rewarded or protected. Patents protect original ideas. Stealing plans and ideas also constitutes theft.

WORK AS WORSHIP

The Hebrew words for work and worship both have the same root (avodar). It is as if worship is work for God.

Worship ascribes worth to God Himself. Worship is not confined to an hour in church, although specific and directed worship is certainly pleasing to the Lord (if offered with the right motives). If we believe that every action offered to God by a believer can be sacred, an act of worship, then our work can also be worship. It doesn't take the place of corporate worship with other believers, but it does add worship in a new vein, another aspect of glorifying God.

When we meet legitimate human needs, we are working for God as much as a pastor, missionary, or evangelist...When work is done with reverence for God and with all your heart, it must be recognized for what it is: worship. [35]

"Worship has priority over work, yet true worship is hard work. work can be a form of worship, and the work of worship has priority over all other work. "[36]

"Always give yourselves fully to the work of the Lord, because you know that your labor in the Lord is not in vain" (1 Corinthians 15:58).

Foundations of Worship

1. Acknowledging the worth of God
2. Specifically, deliberately giving praise and glory to God.
3. Focused on God alone, not on ourselves
4. Offering our actions and ourselves to God
5. Usually Involves a sacrifice (often of time)

Worship requires an inner humbling, a surrender of self-will, a repentance of sin, and trust. It requires cultivating the presence of God. It ascribes to Him the supreme value of who He is and acknowledges His worthiness (worth-ship) in words, deeds, and posture. Worship is hard work. [37]

While these actions and attitudes are specifically present when the Body of Christ gathers on Sunday morning, worship is not limited to something we do in church. In fact, when we catch on to the concept, all of life should be worship. Work can be an act of worship if these elements are present. Work doesn't take the place of weekly "corporate worship" with the church, but neither does "corporate worship" take the place of worship through our work.

The word glory conveys the idea of beauty. So, as we do good work that reflects God's character…we unleash his beauty. People see God. Our work is a way to worship God. It has intrinsic value and can demonstrate God's character when we do good work. Faith and work are to be seamless. Work is an expression of our life in Christ. Separating the two is like separating "being" from "doing." How do you know who you are being without considering what you are doing? [38]

Adam was tasked by God to name animals and to tend the Garden, not toilsome work before the Fall, but actual tasks. Work is somehow related to our humanity and linked to the concepts of fulfillment, creativity, provision, context for ministry, and bearing the image of God. Work is required. It is non-negotiable. It is not a bad or dirty thing. It is toilsome and often difficult, but it existed in Eden's perfection, and it is expected of us here in the fallen world we live in. It is both an expression of the image of a "working" God in us, and the primary way mankind exercises its dominion over the earth… (W) e're not simply talking about churning butter and tilling the fields: the cultivation and development on ideas (i.e. engineering, mathematics, science, philosophy, etc.) is absolutely under the umbrella of the "work mandate." [39]

No matter what I do, if it is to prepare a meal, if it is to sign an invoice, if it is to do an analysis, if it is to close a deal, if it is to make a sale, if it is to make delivery -- whatever it is, I am to do it as if I'm doing it for God, and so it becomes an act of worship.

Martin Luther, the man who sparked the Protestant Reformation, said you can milk cows to the glory of God. You can clean toilets to the glory of God. Why? It's your attitude that says, 'God, I'm doing it as if I'm doing it for you.' For instance, Let's say you make beds in a hotel; you will probably make them nicer if you think, 'I'm doing this as if Jesus were going to sleep in this bed'. [40]

Specific ways to work as worship: [41]

- Work for God only
- Worship God only
- Work and worship God only.

Work and worship intersect in your relationship with God. For the Christian, you work "for the Lord rather than for people" (Colossians 3:23). Now certainly people benefit from your work, i.e., their problems are solved, their needs met, their work becomes more meaningful. For your work to be worship, it focuses on God only.

Work done as worship is excellent work, God-centered work, loving work, and giving work.

We can glorify God through our work as we (1) seek, trust, and rely upon Him, (2) demonstrate His character, particularly love and truth, (3) use the gifts He has given us, (4) impact the world

in a positive way, and (4) thank Him for His empowerment and provision.

A warning is in place here: If work is linked to worship, Christian managers must never presume that requiring more work hours or greater sacrifice of time or effort is somehow a blessing. (This idea was actually mentioned in a discussion on work.)

WORK AND IDOLATRY

Once we have determined the importance of daily work, we risk making it an idol, worshiping our work instead of worshiping God through our work. Our culture heavily and unconsciously influences us.

We can easily turn work into an idol:

- When it consumes most of our thoughts.
- When we count on our work, rather than the Lord, to supply our needs.
- When we find our identity primarily in our work or career position.
- When we put work ahead of worship and family.

In addition, we are worshipping work: [42]

- When we look to it for satisfaction in life
- When we use it as a means for esteem
- When it becomes a source of pride and self-confidence
- When it serves as a gateway for other sins (dishonesty, injuring others)

Here are some (additional) ways or indicators that we are idolizing our work: [43]

- Our work becomes the primary source of our satisfaction – this can reveal itself in various ways: only doing what we are made to do, constant grinding frustration and a lack of fulfillment, a deep-seated self-satisfaction with our achievements, Having appropriate expectations of our work will save us much disappointment!
- Our work is all about being the best so that we can make a name for ourselves – we have an undue emphasis on the pursuit of excellence. However, the issue is not the hard work and desire to do well but rather the need to be recognized, e.g. unhealthy competition, perfectionism.
- Our work becomes primarily about making a difference in the world – work becomes an idol when we elevate its importance to the point where. … we believe the value of our work is ultimately determined by its impact on the world. So we take pride in our achievements, neglect more menial responsibilities, get frustrated when we think our work is a waste of time or beneath our capabilities.

When we are challenged to look to our work as our source of satisfaction, we have to bow the knee to King Jesus and allow him to satisfy. When others esteem us for our work, and we work for that purpose, we have to be reminded of God's deep satisfaction in us because of our adoption into His kingdom. When we allow work to be our source of pride and self-confidence, we need to be reminded of our own sinfulness and the confidence that God has in us because

of the Holy Spirit's presence in our lives. Finally, when work becomes the gateway into a wonderland of idols, we have to be reminded once again to "deny ourselves, take up our cross daily, and follow Jesus." [44]

VOCATION AND WORLDVIEW

Only the Christian worldview has a divine perspective on human significance and the value of work. As such, we need to approach all aspects of the topic from a Biblical mindset.

It is important to realize that not all fields of study or career paths are equally in need of thinking Christianly.

An extrinsic issue is part of one's general Christian vocation but has nothing specifically to do with one's particular career or a station in life. We evangelicals have done a decent job at working on these extrinsic issues. For example, we have sought to train people to share their faith at work and be godly examples of how they conduct themselves. However, note carefully that neither of these—evangelism nor godly living—has anything specifically to do with, say, being a physical education teacher as opposed to being a therapist. We desperately need a renewed commitment to training people about intrinsic issues: learning to think and live Christianly regarding issues specific to what I do in my career.

The more a field is composed of ideas about the nature of ultimate reality, about what we know and how we know things, about moral values and virtues, about the nature and origin of human beings, and about other issues central to mere Christianity. The more crucial it will be to think carefully about how a Christian should integrate His discipleship unto Jesus with the ideas and practices in that field. [45]

WILL OUR WORK SURVIVE?

Will any part of our work here on earth matter or continue once Christ returns? The Bible doesn't tell us for sure. However, there is an indication that there will be music and activity for us.

(Quoting Darrell Cosden)... "There will be, no doubt, some specific products of our work that through judgment will be transformed and incorporated into the 'new physics' of the new creation. . . . If our work really does form and express at least a part of our human activity and personality, and since this work is genuinely now a part of the physical creation, it is not then unwarranted to think that, along with resurrecting us, God can 'resurrect' some of these things too." [46]

CONCLUSIONS

Engineering is both a profession and a vocation. Like law and medicine, engineering is a profession, an area of work that involves specialized knowledge, a code of ethics, and service to humanity. Like every other legitimate area of work, engineering is a vocation, literally a "calling" (from God, who supplies us with abilities, talents, and gifts to serve others.)

Good works

Eph. 2:10 tells us that we were created for good works which God has created beforehand—quote actual verse.

We need to distinguish between (1) work in general, which is effort expended, (2) "works of the law", human efforts to earn God's favor, which do not earn any points and actually insult God's grace, and (3) "good works", made possible after we've become Christians - planned by God, prompted by God, and empowered by God. These are actions that truly please God and bless others. Some would be worship and sharing truth about Christ. Some could be acts of love towards family and other believers or excellent engineering work and positive contributions at the workplace.

Be careful not to confuse work, good works (works of righteousness), and works of the law.

- Work -God intended for people to work.
- Good works -The Holy Spirit inspires and empowers good works in Christians' lives that bless others. ("They will see your works and give glory to your Father in heaven." Mt. 5:16)
- Works of the law -Human effort and failed attempts to keep God's law can't earn salvation.

In summary, Why do we work? [47]

- To earn our daily bread and provide for our necessities.
- To keep us out of trouble, because laziness is the Devil's fatherland.
- To exercise our talents and our gifts, or to acquire some new ones.
- To make a positive difference in an organization or a community.
- To serve our neighbor with our earned blessings.
- To socialize ourselves so that we don't become "incestuous", or totally self-centered.
- To learn from others and to build relationships.
- To advance the Kingdom of God.
- To assist the poor and needy.
- To serve God and God's purposes in unfolding the potential of creation.
- To grow in holiness and Christ-likeness

Doing good works in the daily workplace-

- Glorifies God
- Blesses your employer
- Is fulfilling, rather than drudgery
- It helps make Christianity credible to others
- It is a vote for the truth of your message.

If practiced well and done before the Lord, our work

- Blesses others,
- Pleases God, and
- Fulfills a part of us.

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CHAPTER 9: GOD AND THE ENGINEERS

INTRODUCTION

According to the Bible, God designed and constructed the Universe and continually maintains it. However, we should not think of the Universe as a giant machine or prayer as mechanical. God did not wind up the machine and then abandon it; God maintains His creation:

- "He is before all things, and in Him, all things hold together." (Col. 1:17)
- “He causes the vapors to ascend from the ends of the earth; He makes lightning for the rain, He brings forth the wind from His treasuries.” (Ps. 135:6-7)
- “While the earth remains, seedtime and harvest, and cold and heat, and summer and winter, and day and night shall not cease.” (Gen. 8:22)

IS GOD AN ENGINEER?

Yes, in the sense that God designed and built our world. God created the laws of nature and subsequently used them to create all that we see.

No, in the sense that God is God, our Creator, far above any designation of mankind. At times He is an Artist (sunsets, beaches); at times, He is a Storyteller (history of Israel); at times, He is a Counselor; and at times, He is a Designer (giraffes and zebras). However, several of God's actions (Planner, Designer, Maker, Maintainer) match what an engineer does.

God has to be an engineer to have put all this together. Only an engineer would have the logic and creative genius to build the universe and design and fabricate all the plants and animals. God calculated bone stresses under loads, did chemical calculations for digestive systems, kinematics for muscle movement, pipeline hydraulics for blood flow and electric circuits for nervous systems, and used bird nests' architecture. [1]

Believers will affirm that God planned and made the universe and the planet we call home. As such, we may say that God was the first engineer, but God is far more. When we do engineering, we are copying what God did, using what He gave us.

Scripture indicates that God designed the earth and designed mankind so that people would explore, create, build, and develop. From the earliest civilizations, people have been devising shelters of wood, stone, clay, and tools for agriculture. God also built-in from the start; the raw materials and the physical laws for us eventually to make skyscrapers and space shuttles.

Engineers copy what God has done, but with incomplete knowledge. On a small-scale, we copy what God has done. The sense of Scripture is that God began with an idea in mind and turned it into reality (simply by commanding it to exist!)

Like the artist, we start with a blank piece of paper (or canvas or marble) and eventually develop a finished work, in this case, some practical output.

GOD AS AN ENGINEER

We see God as an Engineer in numerous ways:

- God created the physical laws
- God created the raw materials
- God gave (engineering-applicable) talents to people
- God desires that we use the results to bless people

Scripture indicates that God designed the earth and designed mankind so that people would explore, create, build, and develop. From the earliest civilizations, people have been devising shelters of wood, stone, clay, and tools for agriculture. God also built in from the start the raw materials and the physical laws for us eventually to make skyscrapers and space shuttles.

God can be viewed as an engineer – identifying problems, constructing solutions – wielding His power over creation for the good of Man. In this sense, seeing the engineer in God helps us see the good and proper engineering role. Essentially, God is the ideal engineer and provides a model for the ideal engineer we strive for. [2]

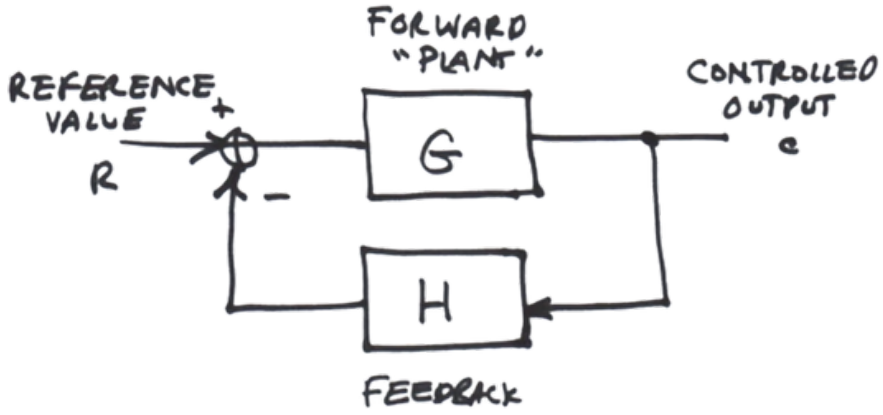
My concept of God, as it has developed over the years…is that he is an engineer, not the scientist that I thought he was when I was a young lad aspiring to be a scientist. A scientist attempts to learn the laws of nature. An engineer knows enough of those laws to create. Hence, God is an engineer with all the knowledge of how the universe works and with the creative mind; as well as, the means and desire to put that knowledge into practice. [3]

GOD AS A CONTROL ENGINEER

The goal of classical control engineering is to continually provide correction and a set of inputs to bring a system to a given value or maintain it within a narrow range of values.

Control systems operate with these components:

- A reference or set-point (goal for the variable)
- A controlled variable (actual output)
- A forward plant
- Feedback of some kind (usually summed in negative)



God has a control-oriented goal for every believer: conformity to the image of Christ. Every decision takes us closer to- or, if sinful choices, further from- that goal. Christian living is akin to optimal control theory. Dan Simon explains it like this:

Optimality in control theory is similar to perfection in Christianity. An optimal control system attempts to minimize some objective function. Theoretically, optimality can be achieved. But practically speaking, optimality will never be attained. This is because of modeling errors, incomplete knowledge of noise statistics, sampling and resolution limitations, and other deviations from ideal conditions. Although optimality will never be exactly attained, optimal controllers and estimators are still quite effective in practice. We do not give up on the notion of optimality just because it is not completely attainable. We continue with our efforts toward optimality, thankful for the performance that we can obtain. The optimal controller churns away in its quest for optimality, never quite attaining it, yet continually getting closer and never giving up. In a similar manner, the Christian churns away in his quest for perfection, never quite attaining it, yet continually getting closer and never giving up. [4]

GOD AS A SYSTEMS ENGINEER

Aerospace and military engineering rely heavily on the skills of a systems engineer. The systems engineer deals with complex interdisciplinary projects; he/she prepares for the "big picture" and brings together all of the individual parts of a large design project to work in harmony.

In this sense, God is like a systems engineer.

We have to determine what would constitute something being "designed." It is not just that a system looks complicated or has lots of parts. For something to be designed, it requires several well-matched, collocated, and integrated components in order to work, where it would not work if any one of those parts were removed. Something like that would need a designer with intelligence and forethought to select the right components, size them accordingly, and integrate them so it could function - and ultimately survive and reproduce.

Each system must be designed alongside the other systems so they will function together. If one system changes something, it may have devastating effects on the other systems. It must be a collaborative design effort. A launch vehicle will not function if only one system is in place while the other systems are being built. A successful launch vehicle requires planning, order, and design; it requires intelligence – and many Designers.

The human body [with its integrated circulatory, respiratory, nervous systems] is the epitome of systems engineering design. What does the body sound like? It sounds like that launch vehicle where the propulsion system needs the structural system, the avionics & software system, and the engine before it can ever get off the ground! *[5]*

GOD AS A PROCESS ENGINEER

A process engineer oversees equipment, systems, and methods in a manufacturing or chemical processing facility. He/she works with design, maintenance, and quality inspection to produce the desired product to its specifications. Dominic Halsmer suggests that we might picture God's work as that of a process engineer:

Some people are opposed to thinking of God as an engineer because they envision him with human limitations, perhaps as a clockmaker who winds up the universe and then steps back without any further interaction. However, neither of these depictions is necessary, nor are they in accord with Scripture. In the Bible, several passages describe God as if he is a "process engineer" refining his people like a precious metal in the furnace of affliction or molding them like a potter molds clay on his potter's wheel. Both of these pictures suggest an engineer who is intimately involved with his creation throughout the entire process. A modern process engineer who works in a refinery, for example, is involved in monitoring the product at various stages and maintaining the appropriate conditions to achieve the desired outcome. Perhaps this is a more helpful picture of our Maker, who not only created us but also sustains us and refines us as he holds all things together by his great power. [6]

GOD AS A PROCESS ENGINEER

Engineers understand symbols and are used to working with symbols that represent various physical entities/realities. The Greek letter omega (Ω) stands for ohms, units of electrical resistance. The letter F with an arrow is an applied force. AgCl means silver chloride.

Similarly, numerous symbols make us think of God and God's ways.

- Wind- the Spirit of God
- Rocks and mountains- God's strength
- Water- washed clean from sin.
- Fire – God's refining
- Light- Christ as the light of the world
- Rainbow God's promises kept
- Snow – made white as snow

- Meal -Christ nourishes us.
- Baptism - Buried and risen with Christ
- Communion - Christ gave His body and blood to save us

Technical metaphors

God describes His actions with metaphors that resonate with engineers-

- God is making a "building" out of His people, and we become "living stones."

"Now, therefore, you are no longer strangers and foreigners, but fellow citizens with the saints and members of the household of God, having been built on the foundation of the apostles and prophets, Jesus Christ Himself being the chief cornerstone, in whom the whole building, being joined together, grows into a holy temple in the Lord, in whom you also are being built together for a habitation of God in the Spirit." (Eph. 2:19-22)

"You also, as living stones, are built up as a spiritual house, a holy priesthood, to offer up spiritual sacrifices, acceptable to God through Jesus Christ." (I Pet. 2:5)

We are His workmanship (created in Christ for good works) (Eph. 2:10)

In addition to word pictures from farming (seeds which fell on rocky soil), fishing (fishers of men), and business (investing ten talents), the Bible uses imagery from technical areas - particularly construction and metallurgy - to teach spiritual lessons:

Foundations-

- Build a house on a rock, not sand (Mt. 7:24-27)
- If the foundations are destroyed, what will the righteous do? (Ps. 113:3)
- Another builds on the foundation. (I Cor. 3:10)

Plumb lines

- A plumb line over Jerusalem (Amos 7:7-8)

Measuring line and level

"I will make justice the measuring line and righteousness the level; then hail will sweep away the refuge of lies and the waters will overflow the secret place." (Isa. 28:17)

Build-

- "Do good to Zion, build the walls of Jerusalem." (Ps. 51:18)

Refining-

- "And I will bring the third part through the fire, and will refine them as silver is refined, and will try them as gold is tried: they shall call on my name, and I will hear them: I will say, 'This is my people,' and they shall say, 'The Lord is my God.' " (Zech. 13:9)

Iron sharpening

- "As iron sharpens iron; so a man sharpens his friend." (Prov. 27:17)

God builds up

"Unless the Lord builds the house, those who build it labor in vain. Unless the Lord watches over the city, the watchman stays awake in vain." (Ps. 17:1)

God tests

"For you, O God, have tested us; you have tried us as silver is tried." (Ps. 66:10)
"The crucible is made for silver, and the furnace is for gold, and the Lord tests hearts." (Prov. 17:3)

God strengthens

"He gives power to the faint, and to him who has no might he increases strength." (Isa. 40:29)
"Fear not, for I am with you; be not dismayed, for I am your God; I will strengthen you, I will help you, I will uphold you with my righteous right hand." (Isa. 41:10)

Engineers understand considering things in context – origination, boundary conditions, and time frame. Believing engineers see our lives as part of a larger reality in the context of God's plan and story.

GOD AS A DESIGNER

Human engineers engage in three primary activities that mirror God's engineering: (1) Design, (2) Problem- solving, and (3) Creativity. These three aspects of engineering are visible throughout Scripture. (See chapter14) for a detailed discussion of design.)

God's design projects have included:

- Creation of the world
- Creation of humans
- Preparing to send Christ as Savior
- Getting the message to the world
- Preparing a future place for believers

CREATION & DESIGN

In the beginning, God planned six specific acts of creation. God designed, God made, and God evaluated (saw that it was good).

From Genesis 1, we have these concepts-

- God begins with the end in mind.
- God begins with a specific plan for His project.
- God carries out the plan in stages and detail.
- Unlike human effort, God can create from nothing.
- God may have considered, but does not need to consider alternative solutions.

DESIGN PROJECTS IN SCRIPTURE

At least four major projects undertaken by humans are described in Scripture:

1. The ark as built by Noah- blueprint given by God
2. The tower of Babel-an act of rebellion
3. The tabernacle (and later Solomon's temple)-blueprint given by God
4. The rebuilding of Jerusalem under Nehemiah-several project management details given

While people designed and built cities, chariots, and tools, on at least two occasions, God gave detailed blueprints to men to build- the ark of Noah, the tabernacle, including the Ark of the Covenant.

Exodus 28 and surrounding chapters about the tabernacle and the high priest's clothing tell us some of God's views on design: He cares about attention to details, craftsmanship, and preparedness:

God knew exactly what (Aaron's priestly garment) would look like in his mind's eye and was describing precisely what the end result should be like. Furthermore, he doesn't just want it thrown together by anyone, he specifically asks for the skillful, whom he has filled with a spirit of skill. God has a passion for Excellence and a passion for Design - together...

So, the next project you start work on or planning for, consider design. Give it the prominence and status it deserves among the projects concerns. It's far more than aesthetics and far more than just structure. Good design can be the difference between success and failure, profit and loss, engagement or rejection. Good design requires time, skill and resources. Don't skimp on it or think you can throw it together yourself to save on costs. Allow designers in as early as you can on a project and value their input as things take shape, and respect the process. [7]

In addition, in the book of Revelation, we see a detailed design for a renewed earth and a New Jerusalem that are not present for us yet. (Rev. 21)

"But as it is written, 'Eye has not seen, nor ear heard, neither has it entered into the heart of man, the things which God has prepared for those that love him.' " (I Cor. 2:9)

GOD AND PROBLEM SOLVING

Engineers are occasionally hired in non-engineering positions because of their problem-solving abilities. The general steps in problem-solving are these:

1. Define the situation and problem that needs to be solved.
2. Clarify the obstacles and conditions of the problem.
3. Generate multiple candidates approaches and solutions.
4. Analyze each to select the most promising possibility.
5. Implement the chosen solution in a logical manner.

At times only one approach may be feasible or may have proven valid in the past. To us, all difficulties look like problems that need solutions.

(Since God knows all possible outcomes and all of the future, He can skip steps 2-4 and immediately implement the "solution.")

In Genesis 1-6 the narrative suggests that God responded to several “problems”:

1. The earth was formless and void. God created light, separated the waters (gases?), and fashioned the stars and planets.
2. There was no one to till the ground. God created a man, in part to till the garden.
3. There was no partner found for the man. God created Eve, the woman.
4. Adam sinned against God’s specific command. God banished the first couple from Eden, placed a curse on the ground, and provided a covering for them.
5. The early civilization was full of sin and violence. God rescued Noah and his family.

In addition-

Nehemiah faced the problem of the broken walls of Jerusalem (and broken spirits of the inhabitants.) God inspired a step-by-step solution involving rebuilding and defending, including a great example of project management techniques.

Israel and Judah faced the problem of national sin and idolatry. God sent prophets to turn them back, sometimes with positive response but often with continued rebellion.

God Himself faced the problem of human sin and separation in the light of His perfect justice. God sent His Son to take our punishment.

GOD AND CREATIVITY

In general, creativity is the (imaginative) development of new, unique, and valuable ideas. It finds expression in art, music, literature, poetry, drama, movies, architecture, and advertising. For engineers, creativity is the key to novel useful products.

Human creativity flows from God's Creation, and can be a mix of God's direction and human wisdom.

God's creative problem solutions in scripture were very often "outside the box."

- God rescued Egypt from famine by having Joseph sold into slavery in Egypt. (Gen. 37-47)
- God's people were spared from the death of all firstborn by putting blood on their doorposts. (Ex. 12)
- God split apart a sea for the fleeing Israelites to cross over. (Ex. 14)
- Joshua's army captured a city by marching around it seven times, then blowing their trumpets. (Josh. 6)
- God pared an army down to 300 men who blew trumpets and smashed pitchers to rout the enemy. (Judges 7)
- Judah's king put musicians and singers doing praise songs at the front of his army to throw the enemy into chaos. (2 Chron. 20)
- God rescued Paul and Silas from prison with an earthquake (as they were singing praise choruses). (Acts 16)
- God sent His Son to earth to die in place of sinful humans. (John 19-20, Rom. 5)

Jonathan quotes Russell Shaw:

My belief about our ultimate origin resides in the existence of God. And if it is true – if it is true that He created the heavens and the earth, and at some point created male and female humans, describing us as being in His image – then we exist in the image of a creative Divinity. When we create – be it designs or paintings, lyrics or melodies, scripts or movies, short stories or lectures, campaigns or solutions to social issues, even lesson plans or to-do lists in their own right – we participate in the nature of God. We find a "sweet spot." Our souls rejoice in the process because we were created to create."

This sounds wonderful to me. To design, to be creative, is to take part in the way we were made – in the image of a creative God. Doing so brings us joy – it was how we were designed to be – to enjoy our work and be creative. I am reminded of a quote from the writers of the movie Chariots of Fire, where the Olympic runner Eric Liddle talks about his gift of running: "God made me fast. And when I run, I feel His pleasure." [8]

When Daniel and his friends were taken captive to Babylon and ordered to eat "the king's food" (apparently consisting of unclean food for Israelites), the young men respectfully offered to the King a "creative alternative" -Let us try our diet for xx weeks and you can monitor the results. Such an approach may be what believers need to take when given an instruction we cannot carry out. [9]

GOD DESIGNED THE WORLD FOR ENGINEERING

Scripture indicates that God designed the earth and designed mankind so that people would explore, create, build, and develop.

When (God) created the world and everything in it, He didn't mean for us to stop there and say, 'God, you've done it all. There's nothing left for us to build. He wanted us to take off from there and really build for His greater glory. [10]

For engineers there can be delight in discovery, delight in creating new things, and delight in seeing a project to completion. These are part of the human experience, prepared for us by God.

Possibly - Just as God has revealed Himself progressively and raised up key leaders at appropriate times, perhaps God inspired people to develop what was needed and fitting at key times in history - the printing press, airplanes, radio, computer networks.

ENGINEERING RELATES TO THE WISDOM OF GOD

Engineering evokes at least two aspects of the wisdom of God. First, the unfolding of God's wisely made creation inspires wonder. The flight of a jetliner is awe-inspiring, and we are moved to echo the words transmitted by Samuel F.B. Morse in an early demonstration of the telegraph: "What hath God wrought!" Not only the intricacy of the mechanism, nor the unlikelihood of its succeeding in its appointed task, but also its ability to serve the needs of man inspired wonder.

Thus engineering also evokes God's wisdom by providing for the evil day, as the Scripture admonishes:

"*Go to the ant, you sluggard; consider its ways, and be wise! ... it stores its provisions in summer, and gathers its food at harvest" (Proverbs 6:6,8).*

The Hoover Dam impounds water for irrigation and hydroelectric power production and holds back large river flows, providing against the evils of drought, burdensome physical labor, and catastrophic flooding. The Christian is led to contemplate the wisdom of God in providing Christ for our redemption and the wisdom that becomes us in fleeing to him before the evil day (Proverbs 22:3). [11]

THE ENGINEERING IMPULSE COMES FROM GOD

The engineering impulse comes to man a gift from God. Material enterprise is not to be shunned; it is to be pursed energetically, but with the service of God always kept uppermost in mind. The most worthy work is, or course, the building of tabernacles and temples and the bringing of offerings to the Lord. But technological effort directed toward prosperity for society is also considered worthy, if the prosperous society is to be devoted to virtuous purposes. Moses made it clear to the Israelites that they were being given a land of abundance, "a land wherein thou shalt eat bread without scarceness ... a land whose stones are iron, and out of whose hills thou mayest dig brass," but only on condition that they continue to worship the Lord and abide by his commandments. [12]

THEOLOGY OF ENGINEERING

Although we seldom discuss them, at least five presuppositions (consistent with the Theistic worldview) are held by those who do engineering work:

1. Matter exists and has a physical reality
2. Physical laws are valid
3. Human reason and calculations can be valid
4. Mathematical models can reasonably represent physical objects
5. Physical objects can benefit mankind

Joe Carson, an engineer with the Department of Energy, has taken the step of proposing several propositions for a Theology of Engineering. After stating the nature of God and man, the Great Commission, and the Cultural Commission (Mt. 5:13-16), Carson sets forth fifty statements about engineering. His key propositions lead to these elements of a theology of engineering: [13]

1) Engineering begins with God's creation

God's role as Creator of the physical universe is primary to the purpose of the engineering profession. Absent God's creating a physical universe, with physical laws and physical beings made in His image, there would be nothing to save or judge, no physical beings with whom to have a relationship, and nothing to engineer. [14]

2) Scientific discoveries and technological advancements have informed our understanding of God.

(Science and engineering) underscore our Creator's prodigiously creative and constructive capacity and will to express it. Additionally, as we better understand our place in the physical universe and increase our technological prowess, our responsibilities and capabilities as stewards of God's creation on planet earth increases. [15]

God's Creation makes possible both science and engineering. Science is tied to the act of discovery (and marveling at what God has made), while engineering is tied to application and problem-solving, using science findings.

Natural sciences are focused on the first and Greatest Commandment - to love God more and better by learning more about the material, inanimate, products of His creative power and mind. Engineering is focused on improving human health, safety, and welfare, reflecting and advancing the Second Great Commandment - to love one's neighbor as oneself. [16]

Both science and engineering should continually bring us back to the wisdom of God in Creation.

Believing there is a deeper reality of God permeating the fundamentals of engineering as revealed by the realities of His Mind expressing the mathematical truths of engineering, my understanding of the practice of engineering will be saturated with the truth of God's word in

the very nature of the endeavor itself! All discoveries, theorems, proofs, facts and experimental evidence will serve only to reveal the presence and practice of the Lord in everything: "And He is before all things, and in Him all things hold together." (Col. 1:17). I will be an engineer that as a Christian sees the truth of God in his sovereign dominion over even the smallest electrochemical reaction within the neurons of my brain that enables me to think. [17]

3) Engineering is an outgrowth of being made in God's image.

Man's original purpose was to advance God's glory by advancing His creation on earth, by using his "image of God" creative and productive capacity and innate need for it to find expression, while enjoying a flourishing relationship with God and his fellow human beings. [18]

4) Engineering is a subset of the "Cultural Mandate." (Gen. 1:28)

Mankind's cultural mandate - to advance God's glory by advancing using its "image of God" abilities to advance His creation on earth in accordance with His will - is described in the first chapter of Genesis and it applies to everyone. [19]

From the beginning—from creation—God intended for us to develop the world. That's the "cultural mandate." Think of all that stuff in Times Square. Or just think about the stuff immediately around you. That's a lot of engineered stuff. (The fabric of your clothing, the building you are in, the electricity used to read this blog or charge your laptop's battery, etc—lots of stuff, all engineered.) All that stuff started out as just dirt or water or air. Then the ore was mined from the dirt, refined, and eventually engineered into stuff. Lots of stuff. Lots of engineering—and manufacturing and marketing, etc. Engineering work is not the only aspect of the cultural mandate, but it is one of them. And because we are sinners, we can't get the engineering just right. It is all tainted by our sinfulness. [20]

Recall that God's dominion commandment was given before the Fall:

Scripture sees humanity as fallen into bondage to sin and sees faith in Christ as the key step in reversing that fall. Thus, if we are to understand God's purposes in the world, we also need to think about God's pre-fall purposes. In Genesis 1:28, scripture quotes God as saying to Adam and Eve, "Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish of the sea and the birds of the air and over every living creature that moves on the ground." Many theologians have used this passage and others to develop the concept of the cultural mandate, sometimes also called the creation mandate-the idea that God's pre-fall purpose for human beings included that their population should increase, they should develop science and technology, and they should develop cultures including social networks, means of communication, art, music, literature, and so forth. [21]

5) The "space-time Fall" has affected all of history, and engineering can impact some results of the Fall.

Engineers understand that the world does not always work properly. Engineering addresses the physical needs of humanity, and parts of engineering are involved with restoration and remediation, physically restoring a broken world.

Engineers do not just solve problems—we are rebuilding a broken world a Christ-centered vision of life that is effective and sensitive to society's needs. Christian engineers have a higher calling to understand the society in which we live and work. Our solutions should not be limited to a single problem: they should contribute to a broader vision of Christian citizenship. [22]

In general, science deals primarily with the effects of Creation, and engineering deals with the effects of the Fall.

6) Engineering itself is affected by the Fall

As fallen creatures, humans can still learn principles of applied science, design, and manufacturing. The problems arise in our motivations, our dealings with people (making ethical codes necessary), and in our use of technology to manipulate or harm other people.

- Engineering is not always done to bless people and glorify God. It is also done for greed, pride, and power.
- Multiple ethical problems arise. There is a clear need for engineering ethics, ideally built on God's truth. (See chapter 15).

Engineering disasters (like the Space Shuttle Challenger explosion) have occurred due to bad decisions and cover-ups. Engineering failures arise from multiple sources related to a fallen world: sometimes clear negligence, cover-up, simply lack knowledge [23]

- We misuse what we create. Some designs have been used for evil purposes, deliberately to harm or kill.
- The profession needs engineers who value God's truth and will influence others for good.

7) Engineering is a "common-grace" activity.

"We contend that both Christianity and engineering exist for more than Christians and engineers – they exist, in part, for all of humanity." [24]

As generally used, "common grace" describes the regularity of the operation of natural processes on earth and their general applicability to all mankind at all times. The products of the engineering profession – the built-environment, the infrastructure of power, water, communications, transportation, etc. – the regularity and reliability of which is essential to our individual and collective functioning in modern society, share some similar characteristics with "common grace" natural phenomena as weather, seasons, time and tides. [25]

Engineering does not exist only for engineers, just as Christianity does not exist only for Christians. It is an improper limitation on the expression of Christian faith, given the cultural mandate and cultural commission, and the collective nature of the engineering profession, for Christian engineers or their profession to a priori determine that faith must be kept private and is not a valid reason, even if only partial, for any engineer to work to uplift the engineering profession and its service to mankind.

(Engineering will become) more important, with more people, they want higher living standards, residing in larger cities, causing more environmental stresses. [26]

8) Christian engineers will live out their Christian life and carry out the Great Commission (Mt. 28:19) within their work.

As we are "going" (about our lives, including our professions), we should also be making disciples, but the premise is that we should be "going" about our lives with all their various facets. By tradition, Jesus was a practicing member of a trade for many more years than he had a public ministry, modeling what we suggest was God's original purpose in creating man - to glorify Him, including through our using our "image of God" capabilities to advance His creation on earth, while enjoying a direct fellowship with Him. [27]

In conclusion, Carson advocates forming a distinctly Christian engineering organization to advance the profession within Biblical principles.

Carson advances these contentions about engineers and engineering: [28]

1. Engineering is arguably mankind's largest and most global secular profession - there are about 20 million degreed engineers around the world today.
2. As a profession, engineering arguably has the most "moral" code of ethics of mankind's professions, with its "paramount" emphasis on public health, safety, and welfare.
3. Engineers are essential to the design, construction, and operation of mankind's "built" environment, which is, now and for the foreseeable future, crucial to mankind's collective well-being.
4. As a necessary outworking of their faith, Christian engineers should model and advocate, individually and collectively, the trustworthy - ethical, competent, and accountable - practice of engineering.
5. Most engineers' most intentional decision was the decision to join the profession and practice engineering for a livelihood - a decision that took years of work and study to implement.
6. Most Christian engineers have great influence and the great opportunity to exhibit the love of God - through stewardship of His Creation and love of neighbor - in and through their practice of engineering and in their individual and collective actions to uplift and advance the engineering profession, particularly through active membership in one or more existing professional engineering societies.

God's sovereign (engineering) control does not preclude human choice.

The biblical writers affirm two sides of a paradox that cannot be ultimately resolved in our limited minds: God is the sovereign ruler of the universe and God has given human beings free will to act in his world. All bad theologies related to this issue come from letting go of one of these poles and clinging to the other. I believe we have to cling tenaciously to both and learn to live with mystery. This requires humility, but that is also a virtue.

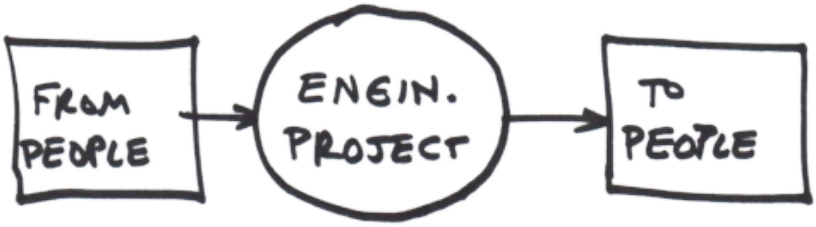
However, in the effort to make God's greatness the controlling issue, Christians have at times ended up denying any meaningful definition of human free will. They end up with a God who is an engineer. He designs and builds the world and controls everything in it down to the last detail. Everything runs like a machine as he designed it. That would make God great but it might keep him from being good. [29]

EFFICIENCY

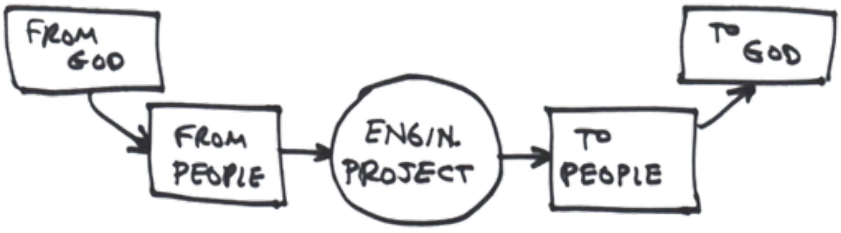
God is efficient, but not in the sense of manufacturing efficiency. God is a Craftsman, and each of our lives is shaped by Him. We're not products of an assembly line, and we're certainly not carbon copies of each other. God is efficient- in that nothing in our composition or experiences is wasted. God has all the time and resources in the world to make us more like Christ.

FROM GOD TO GOD

Olin College of Engineering, a unique institution explicitly founded to produce innovative engineers, had an informal motto for engineering design: "From people...for people." [30] In other words, all designs begin with a human need and culminate in a finished result that should meet human needs. All engineering projects begin with determining the needs of real persons (including, ideally, spending extensive time with those who will use or be impacted by a project to determine their actual needs, desires, and concerns) and ultimately end with the deployment of the design by the user. This is a valuable perspective and must inform our practice.



While this loop must be part of each design, Christian engineers might consciously and deliberately think in terms of a larger loop (encompassing the user loop). Christian efforts in engineering would see it useful to push the motto further on both ends: "From people ...for people" is an important subset of a larger cycle: "From God...for God." While serving people, including meeting their stated needs, all engineering work originates from our Creator (raw materials and skills) and culminates in results that should give thanks and glory to Him.



Rom. 11:36: "For from Him, and through Him, and to Him are all things. To God be the glory forever and ever."

From God-

- All the raw materials of the earth
- All physical laws and constants
- All human ability and creativity
- The expectation of meaningful work and subduing the earth

Through God-

- We perform our activities in His strength and in line with His directions.

To /For God-

- All the glory
- Desiring to please Him in our engineering work
- Loving the people God made

Quote-

And all things were created for him. All that came into being exists for Christ — that is, it exists to display the greatness of Christ. Nothing — nothing! — in the universe exists for its own sake. Everything from the bottom of the oceans to the top of the mountains, from the smallest particle to the biggest star, from the most boring school subject to the most fascinating science, from the ugliest cockroach to the most beautiful human, from the greatest saint to the most wicked genocidal dictator — everything that exists, exists to make the greatness of Christ more fully known — including you, and the person you have the hardest time liking. [31]

INNOVATION THEOLOGY

Innovation expert Lanny Vincent coined the notion of "Innovation Theology."

"Innovation Theology makes the case that God continues to create and continues to invite us, through change, to co-create new value for others (i.e., innovate). Innovation Theology explores where discovery, invention, and value creation intersect (or not) with the intentions of God." [32]

Noting that God is clearly an Innovator, Vincent urges us to be innovative in a Godly way (Do justly, love mercy, walk in humility with God).

The Biblical saga is filled with God intervening in the affairs of mankind to create new and unexpected results-possibilities that were unimagined and unimaginable before they happened:

- The birth of Isaac -to a barren ninety-year old mother.
- A burning bush not consumed in the burning
- An exile and a return from exile
- A Messiah whose Messianic character was not what most thought it would be
- The dramatic conversion of a chief persecutor- Saul becomes Paul

Vincent proposes the following concepts: [33]

- Change is inevitable since God is engaged in change. We must react to change creatively, rather than to react or to isolate ourselves. How we respond to change reflects our resistance to or alignment with God.
- Godly innovation produces results of value for others, rather than merely advancing in the market.
- The quest for meaning must precede the quest for money.
- God' Spirit can inspire us to create new and valuable things.

JESUS AND ENGINEERS

One of my favorite accounts in the Gospels is the narrative in Mark 2-- where the friends of a lame man are desperately trying to get him into the presence of Jesus. Jesus, meanwhile, is teaching inside a house, surrounded by a crowd.

Like good engineers, they are faced with a real problem (How do we get Matt, stretcher and all, past the crowd?) They briefly confer, come up with a technical solution and begin to implement it: Open up the tile roof and lower the lame man down into the room with ropes around his mat. This is great. Jesus is teaching, and all of a sudden, plaster starts falling, a shaft of light breaks down from the ceiling, and, plop, the lame guy is dropped right in front of Jesus.

The rest of the account is focused brilliantly around the logic of Jesus' identity:

Jesus: "Your sins are forgiven."

Pharisees: "Who can forgive sins but God alone?"

Jesus: "Which is easier to say, your sins are forgiven (which cannot be seen), or to say Rise up and walk (which you can see)?"

"So that you may know that the Son of Man has power on earth to forgive sins, I say to you rise up and walk."

Only God can forgive sins and instantly heal a lame man. Jesus just did both.

WILL THERE BE ENGINEERING IN HEAVEN?

The Bible talks about the future state, the realized Kingdom, the New Jerusalem. Will there be engineering or technology in heaven? The answer is unknown. We know that Christ will be there and that there will be no sin, death, or suffering. We will be completed and living in super-bodies. There will be the perfection that was not achievable on earth.

There will be meaningful activities. There will be objects. There will be no need for pacemakers, prosthetic limbs, or medical x-ray machines. There will be no need for refrigeration, heating and air conditioning, sanitation, water purification, or safety measures.

Justin Van der Werff suggests that

This kingdom is not just an ethereal kingdom of a different realm. However, it is a very tangible, physical, earthly kingdom that may very well look a lot more like our present world and life than we expect while at the same time looking far different than we could ever imagine. [34]

Randy Alcorn develops these ideas in his book *Heaven*-

Will there be technology and machinery (in heaven)? Technology is a God-given aspect of human capability that enables us to fulfill his command to exercise dominion. As we have seen, we will find harps, trumpets, and other man-made objects in the present Heaven. What should we expect to find on the New Earth? Tables, chairs, cabinets, wagons, machines, transportation, sports equipment, and much more. It is a narrow view of both God and humans to imagine that God can be pleased and glorified with a trumpet but not a desk, computer, or baseball bat. Will there be new inventions? Refinements of old inventions? Why not? We will live in resurrected body on a resurrected Earth. The God who gave people creativity surely won't take it back, will he? The gifts and calling of God are irrevocable (Romans 11:29)." *[35]*

In *Culture Making*, Andy Crouch considers culture in the New Creation, based on Isaiah 60:

The city is already a cultural artifact, the work of a master Architect and Artist. The citizens themselves are the redeemed people of the Lamb, drawn from "every tribe and language and people and nation" (Rev 5:9). But God's handiwork, artifacts and people alike, are not all that is found in the city. Also in the city are "the glory and the honor of the nations" — brought into the city by none other than "the kings of the earth."...

So it's a fascinating exercise to ask about any cultural artifact: can we imagine this making it into the New Jerusalem? What cultural goods represent the "glory and honor" of the many cultural traditions we know? We already have biblical assurance that the ships of Tarshish will be there; perhaps they will share a harbor with an Americas' Cup yacht and a lovingly carved birch bark canoe. [36]

Crouch elegantly puts it like this: "Culture is the furniture of heaven." This is such a freeing way of thinking about creating cultural works - that our motivation for excellence is not simply to shift more CDs, but instead knowing that our cultural works offer a glimpse of what the New Creation will be like, with culture that is fully redeemed by Jesus's work on the cross. How much more should we care about our work, knowing that it is not meaningless, but has eternal significance? This means too that we can do things like appreciate good music for being good music - diverse and exciting and moving and beautiful - knowing that it is part of God's plan for humanity from the beginning. And that is very good. [37]

We don't know exactly what it will look like, but we have the promise that life with God and without sin and suffering will be wonderful. Almost certainly, after Christ returns, we'll have explanations for all that God made and possibly an understanding of why God did what He did in human history and in our lifetimes.

CONCLUSIONS: WHY DO WE DO ENGINEERING?

God has made the world and uniquely made each person.

We are God's Image-Bearers, lower than the angels but higher than all animals. God has made us creative.

- We are natural toolmakers and culture makers.
- We are given a "cultural mandate" (Gen. 1:28).
- We are recipients of "common grace," along with all of humanity.
- God gave us materials and natural laws.
- God gave us talents and skills.
- We have both a redemptive and a work-related "calling". God blesses the world through human vocations.
- We can glorify God through our work.
- There are human needs that can be met by the practical application of science and mathematics.
- We live in a fallen world that needs restoration, some of which can be supplied through engineering.
- As believers, we are ambassadors of God's kingdom.
- We are agents of shalom.
- We have a Biblical view of the environment (stewardship, not worship).
- The world needs truth.
- The world needs ethics.
- The world needs quality workmanship.
- The world needs compassion.
- The world needs workers who shine in the darkness.
- By living this way, the Christian message has the credibility to others.

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CHAPTER 10: ENGINEERS AND GOD

INTRODUCTION

Engineering professor Lambert Van Poolen was once asked to define what a Christian engineer produces. "There is no such thing as a Christian bridge," was his wise conclusion. The structures or products designed by a believer don't exhibit little crosses or fish symbols, don't play "Amazing Grace" or flash John 3:16. They don't look any different from the same object designed by someone who doesn't follow Christ. They should work well, work safely, and be affordable. At the outset, they should be designed by someone who wants to please God and to serve people, acting with an attitude of joy and love.

We have seen that engineering is

- A career path
- A vocation, one of many valid vocations
- A human activity
- A physical-world activity that uses the materials of the earth
- An endeavor that develops goods, services, and jobs
- An activity that uses creativity and copies God's creativity
- An activity that uses God-given skills and talents for math, science, and design
- An activity that blesses our neighbor and meets human needs
- A necessary activity in a fallen world
- A part of the culture and the cultural mandate
- An aspect of common grace

I recently heard of a local contractor who displayed a Christian symbol on his truck. When asked about the sticker by a potential customer, his response was, "Well, yes, I'm a Christian, but I don't let it interfere with my work." (Note: He didn't get the job.) This is precisely the opposite of the attitude we want to have: "Yes, I'm a Christian, and it affects every possible thing that I do."

Then what does engineering from a Christian position/perspective-as opposed to a non-Christian perspective- look like? The differences will likely appear in these areas:

- Starting point/worldview
- Concept of "calling."
- Motivation
- Love for neighbor
- Decisions about technology
- Ethical decisions

- Concept of stewardship
- Workplace attitude
- Workplace actions

Each of these will be explored in the chapters that follow.

It is assumed that a Christian who is an engineer will seek the Lord, pray, worship, love his or her neighbor, and speak about the Lord. It is assumed that the Christian engineer will work honestly and diligently, respecting other employees. However, the faith-discipline intersection is more than that. The goal is that the Christian engineer would also "think Christianly" about all aspects of engineering work and about what it means to be a Christian engineer.

HOW ENGINEERS RELATE TO GOD: ADVANTAGES

Every personality type and every profession (which often are linked) has traits that make it both easier and more difficult to grow in the Lord. For example, an artist may be awed each day by the beauty of nature, while an engineer will respond to the amazing design evident in nature. Data may convince an engineer; a poet does not care about the numbers. While only God's Spirit can effectively convict anyone of sin or move their heart towards Christ, it seems to this author that engineers, in general, have fewer roadblocks in place (compared to other professionals) to receiving the Gospel and growing in Christ. This observation can be useful in evangelism.

As an Engineer, I design things, and they usually work. The criterion for my trust in the design equations is whether they work. Most engineers cannot undertake the advanced maths that derived the design equations or write the advanced computer programs that now do the designs. We are happy to use design procedures or equations that others have derived. Provided the designs work, we use the design procedures with confidence.

Now, what has this got to do with the gospel? For me, Christianity is an experimental science. I read the Bible and listen to what Christians say. I do not need to know the why's and the wherefores' of the gospel. I only need to know that if I apply gospel principles, it works! However, I also find Christianity logical. I hear about Jesus being God, about my sinfulness, my separation from God, and my inability to help myself. I also hear about Jesus' death on the cross and taking the punishment for my sins. And the fact that as a consequence, God has forgiven my sins and cleansed me from all the contamination of sin and unrighteousness. [1]

Creation

Engineers deal routinely with the order and complexity of the universe. The idea of a Creator is a plausible explanation.

- Engineers understand design and know how difficult it is to develop complex designs (the solar system, the human body) that work consistently. Most microprocessor chips require thousands of man-hours to design and millions of individual transistors.

- Engineers understand probability (including the idea that the probability of independent events occurring is the product of their probabilities). They can conclude that the probability of everything in the universe arising from chance/randomness is essentially zero (i.e., impossible).
- Engineers appreciate design. Much of nature looks like it was designed.

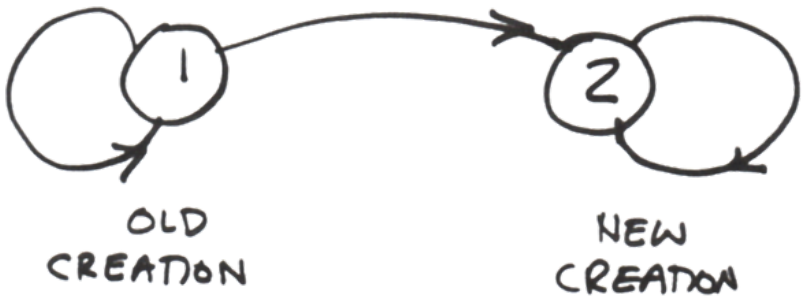
Faith

- Engineers model unseen reality at the level of electrons and electromagnetic fields. They have studied the electron as being both a particle and a wave. A God who is beyond our vision and a Savior who is simultaneously God and man are not impossible concepts.

- Engineers are used to dealing with unseen realities (electric fields, force vectors, electron flow).
- We trust in a God that we don't see. In the same way that we aren't able to see the electrons in the circuits that we build, we can clearly see the results of their motion and charge.
- There are many data points available, evidence for the truth of the message.

Gospel

- Engineers appreciate the logic. The Christian message is very logical –if you begin with God, who is infinite and holy. The Gospel outline in Romans is a masterpiece of logic.
- Engineers understand the necessity of codes and standards. Standards are the only yardstick for determining whether something is being done right.
- Engineers have a feel for operating within constraints, both physical and moral-spiritual.
- Engineers are accustomed to dealing with fixed laws in the physical realm that makes things work. We can't be relativists regarding force of gravity, for example. The idea of universal and unchanging laws concerning morality is a possibility.
- Engineers understand the idea of exclusivity. There is only one way to have ordinary water molecules (two atoms of hydrogen, one atom of oxygen).
- Engineers know the world isn't perfect. They live daily with Murphy's Law.
- Engineers are aware of target goals and understand the idea of "missing the mark."
- Engineers are realists. They may readily become aware of their shortcomings and sins.
- Engineers are used to conservation laws (mass, charge, energy). The total amount of sin in the universe must be accounted for and paid for, either by Christ or by us. (Bill calls this principle the "conservation of sin" or "conservation of crud.")
- Engineers understand substitution. Variables are substituted in equations. Atoms are substituted for others in alloying. At least what the principle means, we can understand that Christ took our place and received our judgment.
- Engineers deal with mathematical domain transforms and with functions of infinite magnitude. A substitution of Christ's infinite righteousness for our own can begin to make sense.
- Engineers understand state transitions. When conditions are met, a system can immediately change for being in State 1 to being in State 2 (or beyond). If conditions are not met, a system can remain in State 1. A person who comes to Christ is instantly justified and made a new creation.



Christian living

- Engineers appreciate goal-oriented living.
- Engineers gravitate towards what works.
- Engineers are used to working within boundaries.
- Engineers appreciate what is practical. Many of Christ's teachings (and portions like the book of Proverbs) are very practical.
- Engineers are all about the practical applications of foundation principles ("theory to practice"). Most of the epistles begin with theological truths, then ask us to live it out, with motivation for doing so. Biblical doctrine leads to a response.

For example,

Rom. 6: 1-13- Since we are identified with Christ in His death and resurrection, we should live as those alive from the dead.

Rom. 8:1-17 - Since Christ has set us free from the law of sin and death, we must walk in the Spirit and put to death all deeds of the flesh.

Rom. 12:1 - Because of God's great mercies, we must present our bodies as living sacrifices.

2. Cor. 5:18-21- Since Christ reconciled us to God we become ambassadors for Christ, urging others to be reconciled to God.

2 Cor. 7:1- Since we have great promises from God who is Holy, we should cleanse ourselves from all defilement of sin.

Gal. 5:1 - Since Christ set us free, we must not become slaves again, neither to sin nor to the Law.

Eph. 4:3 - Since God is able to do more than we can ever imagine, we should walk in a manner worthy of our calling.

Phil. 2:1-5- Because of Christ's love, fellowship, and compassion, we must live in unity, walk in humility, and have the mind of Christ.

Heb. 10:19-20 - Since God has removed all barriers to His presence, we should come boldly to His throne.

James 2:1-7 - Since God chose the poor to be rich in faith, we must not show favoritism in the church.

- Engineers want to see things improve.
- Engineers are not big on emotions. All of the key responses (faith, love, repentance, forgiveness) are decisions, acts of the will, rather than emotions. (Note that you can't command a feeling.)
- Engineers are seldom guided and influenced by emotion. We are to worship in spirit and in truth (John 4:24). Sound doctrine must undergird emotions. The Scripture must direct our decisions. Truth is essential to God's character.
- Engineers are used to having owner's manuals (even if we avoid reading them.)
- Engineers understand handbooks, material compiled to help design in a given area. The Bible is primarily a book about knowing God and the life He plans for us, but it is also a very practical handbook for life. (We must be careful to see it as much more than a manual, and, in fact, God's loving communication to us.)
- Engineers are generally realists when dealing with the fluctuations of life. We don't expect perfection. Some parts of life and some actions delight us, while others confuse and disappoint us. We can identify with many of the Psalms.
- Engineers trust in their theory and calculations. We do not know how well our designs will work, but we trust the foundations and designs based on those principles. Christians do not know the details of the future, but we trust in God.
- Engineers are generally disciplined and appreciate a daily practice of Bible reading and prayer.
- Engineers expect systems to be reasonable. We use reason when we approach Christian doctrines, even if they stretch what we understand. What does it mean for Christ to be fully God and fully man? What does it mean that the Word (identified as Christ) became flesh and dwelt (literally, "tabernacle") among us? What does it mean to "pray without ceasing"? What does it mean to "put on the whole armor of God"?
- Engineers are used to making models of reality.
- Engineers understand the use of illustrations and models to portray very complex concepts. When applied to aspects of God's work, the Bible calls these "types and shadows."

Examples include:

I Cor. 5:7-8 Leaven (yeast) shown as sin to forsake

I Cor. 10:3 Israelites were "baptized into Moses in the cloud and in the sea"

I Cor. 10:4 They "drank from the spiritual rock that accompanied them" (which was Christ)

Heb. 9:10 The layout and sacrifices of the temple were an "illustration for the present time."

Heb. 10:20 "A new and living way opened through the curtain" (into the Most Holy Place) through Christ's body/flesh.

Rom. 5:14 Adam as "a pattern of the One to come"

Heb. 11:19 Isaac was restored as if from the dead (a picture of Christ's resurrection)

HOW ENGINEERS RELATE TO GOD: DISADVANTAGES

Shortcomings of typical engineers

Based on our talents and personalities, engineers exhibit certain strengths and weaknesses. The encouraging thing is that the worst of these weaknesses may be somewhat overcome as the Holy Spirit works in our lives.

Engineers are often characterized as:

- Speaking bluntly -Learn to speak the truth in love (Eph. 4:15)
- Relating poorly
- Valuing things above people - Learn to love and value people as Christ does.
- Being logical without emotions
- Valuing efficiency above all
- Being very narrow-minded ("mentally myopic")

Are there traits of typical engineers that make it more difficult to respond to the Gospel or live Christian life?

Creation

- Engineers expect to understand how the universe works, down to the smallest detail.
- Many engineers expect to see and to measure all that occurs. They will reject any supernatural explanation.
- Some engineers hold the faulty position that God is unnecessary as a cause if science can explain physical phenomena.

Gospel

- Some engineers believe that logic cannot be applied to theological or metaphysical discussions. Others think they can come to God through logic alone.
- Many engineers will attempt to posit a graded scale version of sin. ("On a scale of one to a hundred, of course, I have sinned, but I am far better than Hitler.")
- Engineers want to fix everything ("the engineering syndrome")-including themselves and a broken world.
- Engineers like rules and want to see the results of their effort (but they cannot do any works that will earn Heaven).

Christian living

- Engineers are used to solving every problem themselves. It may be hard to trust the Lord and not to "rely on our understanding" (Prov. 3:5)

- Engineers want to control everything. God must be in control.
- Engineers want to reduce life to simple models and equations, but life and God are unpredictable.
- Engineers are used to planning out every detail of an action, which is not always bad. We need to leave room for God to act and trust God when we do not know what is ahead.
- Engineers are often heavily into processes and rules and run the risk of legalism.
- Engineers are used to dealing with machines, and God is a Person, not a machine. We cannot program Him, follow simple steps, or expect mechanical results. He will often surprise us, and we have to get to know Him.
- Engineers may find it difficult to "worship God with all their heart" since they are uncomfortable with emotions.
- Engineers like precision and often want everything as precise as possible (room temperature at 68.4 degrees; tire pressure at 32.14 psi). The Bible is typically not that precise.
- Reading the Bible can be frustrating for engineers since we always want full explanations for things. Food is multiplied, leprosy is healed, the Red Sea is parted, and we are typically not told how God did it. When some details are given ("God caused a strong east wind"—Exodus 14:21), it's no less a miracle because of the situation and timing.
- Engineers are typically not strong on relationships (fellowship) and discussing personal things. Engineers can find it difficult to talk with others about Christ.
- By focusing on the technical aspects of life, engineers often display a lack of empathy or a deficiency in "emotional quotient." Certainly, God's work in believers makes us all more concerned about others. Compassion can grow as we see the deep needs and hurts in the lives of others. Awareness of emotional cues can be enhanced with practice or training.
- Engineers are good at analysis and practiced at being critical of systems, often also critical of others' actions. We need to learn first to be critical of ourselves along with Biblical standards. (Mt. 7:3-5)
- Engineers must be careful not to make the Bible into a book of codes and equations. The late Harold Camping was educated as an engineer and established a network of Christian radio stations. Unfortunately, Camping got off the track, being obsessed with manipulating the numbers in the Bible to predict the exact date of Christ's return. (His final date, in October 2011, has already passed.)
- The mindset of engineers towards people must be radically different from our mindset towards things. We approach a project or product with an emphasis on improving it, making it more efficient and less costly, and getting it out the door. We know that people matter more than things, but we may not see the person and their needs. We need to approach people with patience, kindness, and compassion.

Andrew Sears gave this insight-

I wish that engineering as a discipline would focus more on the human impact of technology. I believe that an engineer is neither divorced from the end-use of technology nor wholly responsible for its use. I meet engineers with personal angst that they may be building technologies that are primarily used to kill people and, in many cases, in unjust ways. Another difficult aspect of engineering is that we are each such a small part in a much larger machine. Because of that, it is difficult to find the satisfaction of knowing exactly what you accomplished. Another part of this is that often engineers can create things that were intended for good but ultimately end up causing a lot of harm (or vice-versa). I think the best we can do is to try our best to do things that make the world a better place, and if we realize

that we are not doing that, then call a mistake a mistake and move on. If enough engineers do that, it will affect market forces that will benefit initiatives making the world better and slow those causing harm. [2]

DEFINING CHRISTIAN ENGINEERS

Jordan offers this definition: [3]

Christian engineers are Christians who practice engineering.

- They should be competent and hard working.
- They should help create things that are useful to people.

Christian engineering is engineering practiced with the explicit goal of advancing God's agenda in the world.

- Our view of how faith interacts with culture affects how we practice engineering.
- We are interested in applying Biblical principles such as justice and stewardship to our professional lives and technology design. God's special concern for the poor and disadvantaged touches our hearts so that we look for opportunities to use our skills as engineers in ways that build God's Kingdom.
- Christian engineering is not just about technology for the poor. We see all technological development as part of our stewardship and unfolding of the creation, a powerful tool that we must take care to use appropriately.

Beyond having a trust relationship with Jesus Christ, a Christian engineer should have these qualities:

- A Christian engineer has a focus on excellence, knowing that all work is ultimately for the Lord.
- A Christian engineer has a deep sense of responsibility to society as well as to the employer.
- A Christian engineer consciously desires to do good with his or her knowledge.
- A Christian engineer has a real concern for people, particularly in the area of designs.
- A Christian engineer thinks deeply about ethics and ties ethics to pleasing God.
- A Christian engineer has a sense of stewardship with regard to project resources and to the environment.
- A Christian engineer who faces technical (or people) problems will pray for insights to solve the problems.
- A Christian engineer has concern for “responsible technology.”

I’m interested in understanding what difference our faith might have on our engineering practice. That is to say, would someone with Christian convictions design a computer system in a different way? Does a Christian understanding of humanity and humanity’s relation to God make a difference in how we design and build the devices and systems we use every day? Does a Christian belief in fallenness and redemption cause us to design and build different kinds of devices and systems? I would hope so, but I don’t think we engage with this topic at that level. [4]

ASPECTS OF CHRISTIAN ENGINEERS

1. Christian engineers consciously seek to glorify God

The Christian engineer's highest priority and primary motivation is to glorify God. A Christian engineer is someone who uses their God-given gifts of specialist technical knowledge and practical abilities to transform creation into an image of what the new creation will be like so that God is glorified and society is improved (Matt 5:16, Jeremiah 29:7). [5]

2. Christian engineers operate within a Biblical worldview

From a Biblically-based Christian worldview, we understand that "all knowledge is God's knowledge" and that our quest to understand God's creation (his general revelation) is also a quest to understand Him more completely. Therefore, even though there may not be a specific application of the Christian faith principles in every engineering problem, students can often be reminded to take a step back and look at the big picture of His presence and sustaining activity in the world. As an engineer works through the extrinsic elements of a design artifact, a Christian worldview can provide a basis for considering and making the necessary value judgments and choices required by the engineering design process. [6]

3. Christian engineers believe God shaped them to be engineers

I am definitely not an artist. As for music, I literally cannot sing and clap at the same time. With writing, I will let you decide if I am any good at it (please keep the snide remarks to yourself). All I know is I am glad I am an engineer, a profession where it is normal to have graphs and figures cover most of the page. Any text can usually be reduced to bullet points. That is where I'm really comfortable. However, I'm learning that engineering is more than just where I'm comfortable. It's the place where I most often see the Image of God leak out of me. It's where I create. My career so far has centered on testing diesel engines in a lab. For me, there is something exciting about interpreting test data. You start with this meaningless blob of static called data. Then, you reduce it into understandable segments and begin to figure out what it means. It still amazes me how much we don't know about the physics of what happens inside a combustion chamber. Sometimes, there's this really "cool" moment in the analysis when you discover why something totally unexpected might have happened... I was able to take this undecipherable blob of data and refine it into this jewel of real information. Now, the other nerds can stare at my graph and, if I created it well, they'll understand the new information in just a few seconds. Then, we can start creating new solutions to the problems we've found.... It seems that God did not create me to be an artist in the typical sense, but I am pretty good with physics, problem-solving, and visualizing spatial constraints. When I can use those unique gifts of mine to create something that makes our facility run better or improves some product we make, then I know I have the Image of God inside me. And this, I believe, honors my Creator. [7]

4. Christian engineers need fellowship and mutual encouragement

God wants to be involved in all seven days of our week. If five of those are spent in engineering, He wants to be involved with us in engineering.

• Engineering is a vocation, and a vocation is a calling. You may not feel that you were particularly called into engineering, but you were certainly given the gifts which enable you to be an engineer and the character which made you want to be an engineer.
• As engineers, we have a particular perspective on life and a particular way of understanding things which we may find difficult to communicate to others who do not share our mindsets. It is therefore helpful to have contact with other Christian engineers.
• As Christian engineers, we meet particular challenges in our work that are different from the challenges that Christian doctors or Christian bankers face. Sometimes it is helpful to talk such things through with someone who is completely detached from the situation. Often, however, someone who understands the nature of the challenge will be most helpful.
• We are called to apply our faith to our work and to live and work in such a way that others see our faith. In each profession, while the general principles of applying this call may be similar, the practicalities differ. [8]

PRACTICING ENGINEERING AS LOVE FOR GOD

In response to a question asked by an expert in the Jewish law, Jesus clearly stated that the greatest commandment in the Law is the command to love God: "You shall love the Lord your God with all your heart (affections, worship), with all your soul (decisions; desiring to carry out His commandments and advance His Kingdom), with all your strength (abilities, effort, work), and with all your mind (thinking about God's truth and reality)." (Luke 10:27)

What does loving God entail? We grow to know and appreciate Him more.

- Putting God first in all things in our lives. (Ex. 20:3)
- Presenting our bodies as living sacrifices. (Rom. 12:1-2)
- Endeavoring to know Him better: reading His message to us, praying, listening.
- Responding with thanksgiving to His actions and gifts. (Ps. 9:1)
- Appreciating what God has done in salvation.
- Appreciating what God has done in creation: awe, understanding, wise use of the earth.
- Obeying His commandments (keeping from sin, loving others, making Christ known). (John 14:15)
- Being fully "satisfied" in Him, according to John Piper:

The essence of loving God is admiring and enjoying all he is. And it is this enjoyment of God that makes all of our other responses truly glorifying to him.

We all know this intuitively as well as from Scripture. Do we feel most honored by the love of those who serve us from the constraints of duty or from the delights of fellowship?

My wife is most honored when I say, "It makes me happy to spend time with you." My happiness is the echo of her excellence. And so, it is with God. He is most glorified in us when we are most satisfied in him. [9]

John 4:14 points in (this) direction: "Whoever drinks of the water that I will give him will never be thirsty again. The water that I will give him will become in him a spring of water welling up to

eternal life." In accord with John 6:35, saving faith is spoken of here as a drinking of water that satisfies the deepest longings of the soul. And the satisfaction becomes productive, like a well overflowing. [10]

As engineers we love God through our vocation.

Like all legitimate occupations, engineering is also a vocation, or "calling." The development of this concept goes back to the days of Martin Luther and the Reformers.

Vocation is a unique call of God to each person. Vocation is never only about "me" and my personal fulfillment. Living out one's vocation is always about loving relationships with others in the service of the Gospel, Church, and world.

As a call from God, vocation is a lively movement of call and response. It begins in the realization of God's great love for all of creation and, within that reality, God's personal and unconditional love for each one of us. As Scripture tells us, "We love because God first loved us. (1 John 4: 19)

Vocation then is always a call to love in truth. It is about "falling in love with God" and trying to live my life most fully in doing God's will for me in the world. [11]

We love God through seeing work as worship and through seeking to glorify God through our work.

How does a working engineer bring glory to God?

- *We realize that all of our skills and abilities come from God.*
- *We use and develop our talents.*
- *We realize that all of our raw materials come from God.*
- *We commit our efforts to the Lord.*
- *We accept projects in line with Kingdom values.*
- *We desire that our work blesses others.*
- *We depend on His strength.*
- *We ask for insight from Him.*
- *We carry out our work with love and integrity.*
- *We follow Biblical principles in our interpersonal interactions.*
- *We aim for excellence in our work.*
- *We give Him thanks for the results.*

We love God through advancing His Kingdom.

Engineering assists in human redemption by getting the Gospel and Biblical teaching to the world through advanced communication and transportation. While the church appreciates the work of the overseas missionary and the doctor, "we do not often remember that the

missionary's travel would not be possible without a well-designed aircraft or that the doctor's early cancer diagnosis depends on the magnetic resonance imaging (MRI) machine." [12]

Engineers are contributing to world missions in several ways:

- Technical missions (radio broadcasting- HCJB, TransWorld Radio)
- Technical support missions (Missionary Tech Team, Engineering Missions International)
- Technical support within missions' agencies (Wycliffe, MAF, JAARS)
- Assistance for developing nations (World Vision, HCJB Global)
- Tentmaking (self-supporting work along with evangelism overseas)

We love God through restoring the earth that He made.

We might consider four scenes in the flow of history: (1) the world was created -good, perfect; (2) the world as we know it -marred by sin and destruction; (3) the world as we affect it - by engineering, by living in agape, by prayer; and (4) the world as it will be - paradise restored when Christ returns. "Because of the fall, the work of the Christian will not only include caring for creation, developing it, and disclosing its meaning; it must also include healing." [13]

It is important to emphasize that redemption in the Scriptures is the restoration of God's creational intent for humanity and the world, including the development of culture and society through humanity's interaction with the earth. [14]

Some believers may be uncomfortable with the idea of the redemption of the earth, expecting that the material planet itself is somehow evil and destined only for destruction. The world we are not to love consists of greed, lust, and pride (I John 2:15-17), not mountains and oceans.

Many Christians confuse ontological (literal) with ethical categories. When 1 Peter 2:11 says that we are strangers in this world, they think Peter means that we do not belong here—that Planet Earth is not our true home. But if they read the whole verse, they would notice that Peter is using the terms 'stranger' and 'alien' in an ethical way, to warn us to 'abstain from fleshly lusts. [15]

Whereas a dualistic understanding of redemption typically devalues the good world God created and encourages an aspiration to transcend finitude, the biblical worldview leads to an affirmation of the goodness of creation, along with a desire to pray and work for the redemption of precisely this world (including human, socio-cultural institutions) that earthly life might be restored to what it was meant to be. [16]

Christian engineers, according to Heie, should serve as "faithful agents in God's redemptive purposes" by consciously being agents of peace, justice, reconciliation, knowledge, and growth in a fallen world that groans from conflict, unjust structures, pollution, ugliness, neglect, and abuse. [17] "The Gospel teaches that Christ came to save us from sin and all of its effects. While that includes forgiveness of sin, it also means the redemption of work, turning it from toil back to the kind of meaningful labor God intended it to be." [18]

Large and destructive effects of the fall include natural disasters, human sickness, human

injury, crimes against people and property, and war. Engineers have responded by developing.

- Radar tracking systems for hurricanes and tornados
- MRIs, ultrasounds, and CAT scans to aid in medical diagnosis.
- Pacemakers, prosthetics, and insulin pump to maintain health.
- Intrusion detection and alarm systems
- Early-warning radar systems

Just as medicine combats the effects of the fall on the human body and law combats the effects of the fall in human injustice, so engineering combats the effects of the fall in areas of the natural world. Communication is established, travel is made possible, medical equipment extends lives, and clean water is supplied to cities. Is the restoration ever complete? Clearly, it is only partial and will not be complete until Christ returns, but it is nevertheless meaningful and essential. (No one despises medicine even though people eventually still die.)

We must include environmental considerations in all engineering designs, but we must never make the environment sacred or central to all of life. Humans are always more valuable than the environment.

We love God through our ethical practice.

Bill Jordan makes the case that ethical behavior can be based on the understanding that all of our work has God for an audience.

Even if no one else appears to be watching, God is. It is, therefore, God's opinion about our work that really matters. (Os) Guinness refers to this as working for an audience of one. We need to do all of our work so that our Audience of One is pleased with what we do. [19]

Engineering practice is regulated by codes of conduct that have been developed by various professional societies and the State Boards of Registration. As Christian engineers, we believe the Bible is a more important standard for living and working. As Christians, we wish to be ethical in the practice of our profession. We are, therefore interested in how the Bible and codes of conduct can be related to each other. [20]

PRACTICING ENGINEERING AS LOVE FOR GOD

The second great commandment is to love our neighbor as ourselves. All the commands of the Scripture can be categorized into loving God and one's neighbor. (Rom. 13:9-19)

What might love for our neighbor entail?

- Valuing our neighbor
- Desiring good for our neighbor
- Meeting real needs of our neighbor.
- Sharing Christ's love with our neighbor

- Practicing our vocation as a ministry to our neighbor
- Relating kindly to our neighbor
- Protecting our neighbor- designing for safety

Love for my neighbor involves doing all within my power for his good. This includes the development and refining of life-improving and life-saving devices and technologies. Our service to God involves all of life, as is shown clearly in the following passage, which is set in the context of the work and duty of slaves to masters, but certainly applies also to vocations chosen voluntarily. 'Whatever you do, work at it with all your heart, as working for the Lord, not for men, since you know that you will receive an inheritance from the Lord as a reward. It is the Lord Christ you are serving. (Col 3:23-24 NIV) [21]

God has placed engineers in a unique position to wrest the power and secrets of God's creation for the benefit of men and women everywhere. In this way they perform services and create products that allow people to be comfortable, be safe, and have longer lives. God in His common grace has provided for the engineering profession, and when men and women are called to be engineers, they are in their profession being obedient to God's command to love one's neighbors. [22]

Loving our neighbor through our work

Work as a structure of love consists of three elements: provision, goodness, and security. Provision is the "supplies" or resources that will meet needs--food, clothing, housing, justice, medical care, art, or information, and these supplies come from the abundance that God has provided in and around us.

Goodness is having the heart to love others and wanting to provide for them what is good and best. It is not by chance that the word goods use the same root as goodness and that both trace their core meaning back to God. Security is protecting and promoting what is good and eliminating or suppressing what is evil. Securing the lives of the people in a community by ensuring that the sources of provision and goodness are maintained allows a just and merciful society to flourish and bless. [23]

Loving our neighbor by engineering "for the benefit of mankind."

Practically applying mathematics and science to the benefit of mankind is part of the definition of engineering. What does it mean to perform engineering "to the benefit of mankind?" Is most engineering actually done to the benefit of mankind? Jordan [24] raises this question in a conference paper. The issue is very subjective. One approach would be that the positive effects outweigh the negative effects.

Engineers fulfill a special place within God's Creation Mandate. There are few professions whose purpose is more directly involved in subduing creation for the benefit of mankind than engineering. The engineering profession is everywhere concerned with making the world a little better for mankind while extracting and using its resources to produce great benefits for people everywhere. In doing so, the engineer is uniquely equipped and positioned to love her

neighbor through her profession. Consider for a moment several great examples of the ways in which the profession of engineering has benefited mankind as it shows forth God's common grace [medical imaging, radar imaging]. [25]

Loving our neighbor through our ethics

We can love our neighbor through the ethical practice of engineering, the way in which we carry out our engineering as it affects the public.

Sooner or later every practicing engineer will face an ethical issue of some kind, if only as small as accepting gifts from vendors. (Company policy manuals often address this with a given acceptable value amount. Obviously, a pen set with the vendor's name is in a different category from a trip to the Bahamas.) Clearly, engineers who follow Christ as Lord should act in an ethical manner.

Each of the major engineering societies publishes a code of ethics, typically beginning with the statement that "engineers shall hold paramount the public's safety, health, and welfare." This is undoubtedly consistent with Biblical teaching and love for our neighbor.

Loving our neighbor through seeking human flourishing (remove any redundant sentences)

The Biblical pattern is that redemption leads to peace with God and with others (Rom. 5:1). The Hebrew word shalom is often translated as peace but carries a larger sense of full health, justice, well-being, prosperity, growth, and human flourishing. Mere survival moves to abundance. Our question must be, "How can we as engineers promote God's shalom in the world?"

What might human flourishing imply? At a minimum, our basic needs (food, clothing, shelter) are met. Relationship with God is restored through trust in Christ, leading to the abundant life that He promised. There is freedom from fear – of starvation, attack, and destruction. Once minimum needs are met and safety is ensured, people can develop a culture. Labor-saving devices now free people's time for other activities, which could include reading books, enjoying art, and healthy recreation.

Human flourishing involves both personal and societal

- physical, emotional, and spiritual well-being
    - a sense of purpose and worth
    - sense of attachment to place
    - understanding of foundational truth, goodness, and beauty
    - hope for the future and gratitude for past
    - redemption from our fallen nature [26]

The opposite of flourishing appears in Babylon's description in Rev.18:22-23: The work of artisans and laborers, shipping, and commerce has come to an end. The sound of music and

laughter has disappeared from the streets. [27] This is obviously not God's intent for human culture.

Can the conclusion be avoided that not only is shalom God's cause in the world but that all who believe in Jesus will, along with him, engage in the works of shalom? Shalom is both God's cause in the world and our human calling. Even though the full incursion of shalom into our history will be divine gift and not merely human achievement, even though its episodic incursion into our lives now also has a dimension of divine gift, nonetheless it is shalom that we are to work for and struggle for. We are not to stand around, hands folded, waiting for shalom to arrive. We are workers in God's cause, his peace-workers. The mission Dei is our mission. [28]

"God's desire for human beings to flourish occurs within His desire for the whole creation to flourish. His command, 'Be fruitful and increase in number," was not only given to human beings but to birds and fish as well (Gen. 1:22). It follows that mere human flourishing is a hollow flourishing; a flourishing that by itself falls short of God's desire for the creation." [29]

Clearly, engineering can contribute to "shalom." Clean water, emergency shelter, affordable energy, safe bridges, and health screening are some of the projects our students and faculty are working on. "Creativity for the sake of generosity", writes Spencer, is the essence of human flourishing. [30]

Among the latest contributions to human well-being are high-tech agricultural techniques (GPS precision planting, high-density land productivity, satellite prediction of crop yields, and genetic analysis for plant breeding), with the goal of feeding a coming world population of 10 billion. [31] In the area of quality-of-life improvement for disabled individuals, engineers are developing cooking and cleaning robots and thought-controlled wheelchairs. [32]

The National Academy of Engineering recently published a list of the NAE Engineering Challenges. [33]

Many of these have an obvious fit with designing "to the benefit of mankind" and resonate with students:

- Develop carbon sequestration methods
- Manage the nitrogen cycle
- Develop carbon sequestration methods
- Manage the nitrogen cycle
- Provide access to clean water
- Restore and improve urban infrastructure
- Advance health informatics
- Engineer better medicines
- Reverse-engineer the brain
- Prevent nuclear terror
- Secure cyberspace
- Enhance virtual reality
- Advance personalized learning
- Engineer the tools for scientific discovery

Loving our neighbor through seeking peace and justice

Peace and justice are Biblical concepts strongly tied to the OT prophets. We seek the Kingdom of God- where God Himself rules, where God's ways dominate, where all the fall effects are reversed -all separation, all destruction, all chaos, and all injustice.
`

The origins of poverty in developing countries are tied to lack of access to clean water, sanitation, health care, nutrition, education, employment, transportation, and electrical power. [34] Many of these gaps may be partly alleviated by engineering solutions, provided that the local community is involved, local materials are used wherever possible, and anything developed fits with the local culture.

Loving our neighbor through wise use of technology

We can love our neighbor by the way we handle technology. Technology commonly refers both to the process of making and using objects (manufacturing, networking) and to the resulting objects themselves (automobiles, robots). Technology typically involves (1) man-made activity (2) affecting the natural world and (3) resulting in practical devices. [35] If we see technology as the product of engineers' efforts, then engineers should have a say in how that technology is used and whether it is used to promote love for our neighbor. Positive aspects of technology are readily seen: making life easier, drawing people together, providing emergency assistance after an earthquake.

There is no question that modern life in the industrialized world is reliant on technological systems which we typically take for granted. We depend on technology to transport people and goods from place to place safely, to provide sanitary living conditions, to protect people from extremes of the physical environment, and to allow communication with people both near and far. Technology has contributed, in ways too numerous to count, to the flourishing of many individuals and cultures. [36]

Technology appears in various forms throughout the Bible, including God's instructions for the ark, the wrongly motivated Tower of Babel, articles for the tabernacle (God's blueprint), chariots, weapons, wells, and ships. The Scripture uses technical concepts to teach spiritual lessons - building on the words of Christ as a solid foundation for a building, using a plumb line to ensure straightness, controlling the tongue like a small rudder turns a ship. Dyer [37] makes the case that technology did not develop after the Fall, but instead that Adam must have used simple tools to cultivate the Garden. Each technological advance can be seen as either a humanistic attempt to avoid the effects of the Fall (Babel) or a response to God's direction (the Ark).

Loving our neighbor by practicing "engineering for shalom."

A class of students at LeTourneau was asked to define characteristics of "Engineering for Shalom." These are some of the items they came up with:

- Consciously desiring human flourishing.
- Promoting increased interaction with God and others
- Keeping the user's well-being in mind throughout the entire process
- Solutions that benefit all of the people involved
- Keep others safe
- Improving the quality of life
- Designs that bring peace and well-being to everything around them
- Reduce effects of disease, separation, brokenness
- Giving rather than receiving
- Reducing toil and drudgery
- Improving relationships
- Helping people engage in activities that strengthen and enrich them
- Reducing stress for self and others
- Stewarding resources well
- Improving the standard of living
- Helping to solve problems others can't solve

POSSIBLE STRUGGLES FOR CHRISTIAN ENGINEERS

Engineering values

When we evaluate something engineered, we often look principally at its material properties

- strength/ endurance
- conductivity
- corrosion resistance
- resilience

We can probably find character analogies or spiritual analogies to each of these.

When we evaluate an engineered system (made of multiple components), we often evaluate such properties as

- reliability
- maintainability
- efficiency

In an amplifier efficiency, N is defined as power delivered/ power supplied.

In a mechanical system, Efficiency =power out/power in.

Jeremy Van Antwerp has observed that efficiency can be a two-edged sword for society:

An engineer (or engineers) has created a device that will make farm labor more efficient. This has the potential to lower the cost of food production, which will lead to more plentiful food.

The engineer also realizes that this will result in some family farms being forced out of the business of farming, which will lead to increased urbanization. The exact ramifications are not clear (because, among other things, humans cannot predict the future), but the engineer sees the potential for big changes in society as a result of his technology, both for good and for ill. [38]

Personal efficiency is defined slightly differently.

Efficiency may be useful in carrying out some tasks, but never in ministry or relationships. It is not "efficient" to spend time

- helping the poor
- showing mercy
- building relationships
- spending hours sharing the gospel whether or not anyone responds

but it is good and pleasing to God to do these things.

At least four traditional engineering values work for industrial processes but not for our Christian lives:

1. Productivity- we need "Sabbath" breaks, need time with God and others, even if "unproductive" to projects.
2. Efficiency- we need to invest time into valuable efforts, including worship and building relationships.
3. Cost-savings- we need to be generous.
4. Conciseness- we need to spend time understanding and being understood.

Modern Engineering and Christian Values

Based on the book *Power Failure* by Borgmann, Ethan Brue [39] makes the case that modern engineering (and modern engineering education) run counter to Christian values in four key areas:

- Analyzing -everything is looked at mathematically.
- Modeling (reductionism)-prediction as a means of control
- Optimizing (control)- looking only at the process, not at true needs
- Efficiency - saving time doesn't fit with worship or loving one's neighbor.

Christians and non-Christians alike find agreement on one point. God is inefficient. He completely abandons economies of scale and the efficacy of standardization. He is unapologetically wasteful in utilizing every potential color, shape, size, skill, ability as he creates and recreates. God loves diversity. The ridiculously overdesigned creation is a glaring testimony to his lack of optimization. He also entrusts the care of this creation to a group of inadequately trained caretakers, opening the door to a myriad of failures as this group tries to get their minds around the vast diversity of interrelationships and the dynamic potential in creation. He has been known to patiently take thousands of years to teach a story of

redemption and outline a process of reclamation, leaning heavily on the work of temporary interns and student teachers to point the way. [40]

The solution, suggests Brue, is to alter our education to ensure that it is totally rooted in grace. The alternative to the modern mindset would be to ground the curriculum so deeply in God's truth that we approach all of life from a distinctly Biblical mindset (humility, enabling, loving, serving). What we do to manufactured things (measure for acceptance, reject if outside bounds, pound into shape, cut to size, subject to extreme conditions) we would never do to persons.

Motivation

One of the key considerations in deciding whether to embark on a project or not is our (actual) motivation. Is a proud heart involved? Do we need to prove that we're better than some other engineer? Is greed a factor? Are we in it just for the financial rewards? Are we envious of someone else's success? Galatians 5 catalogs the "fruit of the Spirit" (love, joy, peace,..) and contrasts it with the "(deeds) of the flesh", which include selfish ambition, dissensions, factions, and envy. One way the Lord can guide us in decision-making is to reveal our true motivations.

While not every decision is spiritual in nature, nearly every decision has a spiritual dimension component. Most of the time, this has to do with our motivation:

- Am I working just to make money?
- Am I tackling a project to impress someone, to prove something, to gain fame, to put someone down?
- Do I think I'm the only engineer who can do this?

What lasts?

I remember reading the account of a young engineer who was devastated when one day he looked down the hallway and watched as the aerospace model that he had worked on for over a year was being hauled out to the dumpster. Some engineering products and projects last for years, and some last only a few months. Many designs may never see the light of day. Ideally, our work produces long-term results, but regardless of the time scope, we need to work diligently.

Are all designs beneficial? Unfortunately, many engineers may not invest time considering this question.

From the author's experience, many engineers are not very reflective people. The fact that they do not write about the need to benefit society in their work does not necessarily mean they don't want to benefit society. They may think that society's benefits from the work are obvious by the nature of the new products they create. One way to reconcile the idealistic statements with the reality of engineering practice is to consider what it means to benefit humanity in our engineering work. Newberry writes that using a utilitarian ethics approach, "benefit, therefore

comes to mean on balance". *Does the good produced by the engineer outweigh the negative consequences of the work? While this is a reasonable way to interpret the codes, there is still the complex issue of how to measure the good and bad produced in a given project. [41]*

It's a subjective call. Most designs are not harmful. Some have benefits that outweigh the negative effects. American industry has a large range of choices. Some engineers might choose to work only to produce food, shelter, or medical devices.

Where do we work?

Christian engineers would not want to be working for a company that produces abortion-inducing machinery or clearly unsafe products. What about products that seem like luxuries and not necessities?

What about working as an engineer for a luxury car company, say, Mercedes Benz or Jaguar?

Few Americans can afford the product, and literally, no one in the poorest nations will ever own a luxury automobile. Some believing engineers would not be comfortable working there. The product, however, is of high quality and is affordable to some. There is more to life than necessities. Scripture talks about such things as festivals, musical instruments, and jewelry. Every legitimate company needs people concerned for safety and ethics and needs a Christian presence.

A Jaguar Land Rover engineer came and did a talk at my church – and he told us how he wrestled with feeling guilty about working on the Evoque – a gas guzzling 'Chelsea tractor.' In the end, rather than just quitting and doing something that he thought was more ethical, he decided to stick it out and try to improve the environmental credentials of the car and company in general…(This) might sound like a cop-out or a bit of self-justification – but there is a biblical precedent doing mission wherever God has put you. Nehemiah was employed by a Godless company (the Babylonian government). He worked diligently at his civil engineering project (rebuilding the walls of Jerusalem), but refused to compromise his faith in the face of difficulty and was a witness to the transforming power of God in his community. [42]

On the other hand, it may not be right if the motivation is primarily the salary or the prestige.

Bottom line: Go where the Lord directs you.

The issue of contentment

Phil. 4:11 says, "I have learned in whatever state I am therein to be content."

But I'm an engineer. I always want things to be better. Should I be satisfied

- that some people don't have clean water?
- That some children aren't able to walk?
- that people fear terrorist attacks?

- I'm not as close to God as I'd like to be?

We need to read the verse (and all verses) in context. The apostle Paul is saying that he has learned how to live in humble means or in abundance, in whatever circumstances the Lord calls him to at a given time, through the strength of Christ.

If we're convinced God has led us to a job and location, it is healthy to be content and to "bloom where we're planted." This is the opposite of discontent, envy and covetousness.

Because we live in a fallen world, we can do something about it:

- Fight against evil and injustice.
- Overcome injury and sickness.
- Make the Gospel known.
- Keep learning, and continually desire to know Christ better.

Typical temptations for engineers

1. Focus on the work of our own hands instead of God's gifts in creation and results of the work for others
2. Cut corners, pad budgets, cheat the company.
3. Produce sloppy or poorly documented work
4. Do as little work as possible.
5. Start out wanting to bless others and end up seeking money, fame, and power.

Paulo Ribeiro suggested such in a short fable based on C.S. Lewis' *The Great Divorce*, a dialogue between engineers in Heaven and Hell:

It was all a snare. Powerful simulation tools, paper writing, and international conference presentations are all necessary down there, but they are also dangerous stimulants. Every researcher, college professor or professional engineer is drawn away from love of doing engineering as part of our cultural mandate and praise to the Creator, to the love of the telling others about it till, down in Deep Hell, they cannot be interested in God at all but only in what they say about Him. For it does not stop at being interested in engineering, you know. They sink lower – become interested in their own personalities and then in nothing but their own reputations. [43]

Additional temptations for engineers:

1. Live and work primarily for money.
2. Add features the client didn't want, whether to satisfy oneself or to boost the cost (if paid by time and materials rather than initial bid)
3. Pride

Pride has two aspects:

1. Comparing myself to others and concluding that I'm better (or smarter or a harder worker) than you.
2. Concluding that I don't need anyone's help, including God's

Engineers are highly educated professionals with expertise in a technical area. It is easy to get into a pride trap.

If God has entrusted a task thus to engineers, which is to cultivate the earth for His glory and for the sake of being a blessing to fellow human beings, what is expected of them, except that in the end it was found that they were "trustworthy" (1 Cor. 4: 2)? Therefore, let us who know God answer that trust that God has given to us with fidelity. And after we have finished our work, let us be allowed to say to God, "we are simply useless servants; we have just done what we were told to do "(Lk. 17:10) and may we find Him saying," ... Well done, good and faithful servant; you have been faithful in a very little, I'll give you the responsibility for great things. Come and enter the joy of your master "(Matt. 25:21). [44]

A BIBLICAL VISION FOR ENGINEERING

D. R. Bartlett offers these insights (originally specified as Mechanical Engineers) [45]

Engineers, like Bezaleel, are gifted by God with the wisdom, understanding and knowledge needed to obey God in the building of His Kingdom according to the pattern of His Word in time and space (Exodus 36).

Engineers use scientific, mathematical, practical, and logical understandings of God's creation as a basis to seek Heaven's assistance in the conception, design, prototype, manufacture, and management of products and services which serve God and man.

Engineers living in relationship with God the Father, through the Lord Jesus Christ, by the Holy Spirit can and do set goals and accomplish what other (Engineers) cannot.

Engineers live in an integrated world because God, as creator and sustainer of all things, brings unity and meaning to everything. Therefore, (Engineers) integrate their faith in God and His Word with their products and services through the conscious understanding, application, and acknowledgment of Biblical truths that are consistent with the historic Protestant faith.

Engineers operate with an understanding that God rules over all elements of civilization and take into consideration the Biblical views of each element of civilization as they conceive, design, prototype, manufacture, and manage the innovation of products and services. Common elements of civilization that (Engineers) consider include evangelism, morals, biology, economics, education, arts, authority, geography, history, language & literature, civil law, Biblical law, mathematics, philosophy, psychology, sociology, theology, eschatology, and government.

The result of an Engineer's efforts brings glory to God and joy to the (Engineer), and those (he/she) serves in both time and eternity.

CONCLUSIONS

Engineering clearly is a respected profession, entirely fitting for a believer.

As the former US President and mining engineer Herbert Hoover wrote, "[Engineering] is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy.

Then it brings jobs and homes. Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege."

Hoover's quote provides a good definition of what an engineer is, but the Christian engineer's highest priority and primary motivation is to glorify God. A Christian engineer is someone who uses their God-given gifts of specialist technical knowledge and practical abilities to transform creation into an image of what the new creation will be like so that God is glorified and society is improved (Matt 5:16, Jeremiah 29:7). [46]

The engineering mindset can get us off track when we deal with God. We don't ever want to think of

1. God as computer/machine
2. People as projects
3. Life as primarily a series of tasks (flow charts)
4. Prayer as pushing the right buttons
5. The Bible as instruction manual only (It is primarily a message from God: divine truth, lamp, sword, and mirror, divine wisdom)

Based on Eldred's approach [47] we might consider a revised definition of engineering:

Engineering is the practical application of mathematics and science to solve problems *for the blessing of people and the glory of God*.

Tips for Christian Engineers [48]

1. Recognize the privilege of working in engineering.
2. Seek out other Christians, whatever the extent of their engineering appreciation.
3. Be aware of the extra pressures a Christian engineer can experience.
4. Remember that engineering can be quite a difficult challenge.
5. Recognize that engineering is a genuinely Christian vocation.
6. Recognize that engineering is constantly in change mode.
7. Do not expect to get by in engineering without disappointments and frustrations.
8. Guard your prayer life – do not let engineering activities squeeze it out.
9. Remember it is not the "Caring" profession, but people still need care.
10. Look for ways of helping others, both engineers and those of other disciplines.

Multiplying and Distributing

In John chapter 6, we read the account of Jesus feeding 5, 000 people (at least) from five loaves of bread and two small fish, apparently a boy's lunch. While we understand it as a miracle and a lesson about Jesus meeting huge needs from our meager resources, we might also use it as a model of our engineering work:

- We take the stuff of earth.
- We dedicate it to the Lord.
- We give thanks for it.
- We break it into its constituent parts.
- We distribute the new pieces to meet people's needs [49]

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CHAPTER 11: CHRISTIANS AND SCIENCE (NOT CHRISTIAN SCIENCE!)

INTRODUCTION

If I were to ask the average high school student or person on the street, "Who was responsible for the original moon landing and success of our space program?" the answer would invariably be, "Why, the scientists, of course. Modern science developed all of it." Engineers will cringe and then try to explain that while scientists discovered the physical laws and studied the solar system it was the task of engineers, working with scientists, to develop the propulsion system, the lunar module, the astronaut's suits, and all of the communication. Engineering, we recall, is that practical application of mathematics and science for a specific goal.

The physical sciences are foundational to engineering, particularly physics and chemistry. Geology is essential for civil engineers, and parts of biology, especially human anatomy and physiology, are needed for biomedical engineers. ABET, the accrediting body for engineering, requires that an engineering curriculum contain at least 30 credit hours (approximately one fourth of the entire degree) of mathematics and appropriate science.

The National Academy of Science (NAS) defines science this way:

"(Science is) the use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process". [1]

The NAS elaborates on this definition as follows:

In science, explanations must be based on naturally occurring phenomena. Natural causes are, in principle, reproducible and therefore can be checked independently by others. If explanations are based on purported forces that are outside of nature, scientists have no way of either confirming or disproving those explanations. Any scientific explanation must be testable -- there must be possible observational consequences that could support the idea but also ones that could refute it. Unless a proposed explanation is framed in a way that some observational evidence could potentially count against it, that explanation cannot be subjected to scientific testing. [2]

Richard Bube offers this definition of "authentic science":

Authentic science" is a particular way of knowing, based on descriptions of the world obtained through the human interpretation of natural categories, of publicly observable and reproducible sense data, obtained by sense interaction with the natural world. [3]

We celebrate the fact that Science has led to huge breakthroughs in medicine, chemistry, and

materials science. Profound Discoveries of science in the last century include:

- Interior of the cell
- DNA molecule
- Subatomic particles
- Distant galaxies
- Life and death of stars

Numerous scientific principles are in place which make engineering possible. A few of these principles are the following:

- Ohm's law: Voltage is directly proportional to the product of current and voltage. This forms the basis for all of circuit theory and electronics.
- Newton's (first) law states that objects in motion tend to stay in motion and objects at rest tend to stay at rest unless acted on by external forces. This concept is basic to the flight of airplanes and the launching of rockets.
- First law of thermodynamics (conservation of energy): the internal energy change in a closed system is equal to the heat supplied minus the work done. This principle is basic to all engines and refrigeration systems.
- Friction: a force between contacting surfaces that resists motion. Friction is key to the action of vehicle tires on a roadway and to most braking systems.
- Maxwell's equations: Four equations, expressed in integral or derivative form, which define electrical and magnetic fields and the relationship between them. These are the foundation for all broadcast communications.
- Bernoulli's principle: for steady flow, the sum of kinetic and potential energy remains constant. An increase in velocity is accompanied by a decrease in potential energy or pressure. This concept is basic to the lift of an airplane wing.
- Piezoelectric effect: Certain crystals generate electrical charge when stressed and change dimensions when voltage is applied. This is the basis of ultrasound sensors.
- Diffusion: Particles in solution tend to move from regions of high concentration to regions of lower concentration. This concept is the key to kidney dialysis machines.

While engineers depend on physical sciences for understanding of basic principles of matter and energy, scientists depend on engineers for design of measuring instruments and practical applications of their findings. It becomes clear during discussion that engineers and scientists think differently, and scientists sometimes think differently from everyone else:

There's a story about a rancher who raised horses in a very remote region whose horses were keeling over as they tried to do their normal run. There was no veterinarian available for hundreds of miles, and the only scientist nearby was a physicist. The rancher hired the physicist, who did countless pages of calculations and then carried out numerous changes. Eventually all the horses recovered. "I'd be interested to know how you approached this problem," said the rancher. "Well," said the physicist, "If you really want to understand, you have to begin with a frictionless, spherical horse."

THE BASICS OF SCIENCE (BY BILL)

What's behind science? What is it based on?

1. Experimentation
2. Physical laws

Which comes first?

Experiments determine physical laws. We use experiments to find what's really there. The laws we write are based on our experience. The physical effects are there, and we model them.

We drop a ball over and over and finally can write

X =Xo +Vot+1/2 at2 (squared)

However, the experiment gives us no assurance that the ball won't sometime go up. Originally, science was based on faith in experimental results and an orderly universe (a God-ordained universe).

THE SCIENTIFIC METHOD (BY PAUL)

At some point in a science class most people have learned the systematic approach to studying nature commonly called "The Scientific Method" (dating back only four centuries):

- Make observations of the world that give rise to a problem or question.
- Propose a hypothesis (conjecture) that is testable (predict the expected outcome).
- Test the hypothesis (experimental research).
- Analyze results and draw conclusions.
- Refine the hypothesis if necessary.
- Communicate the results.

Scientific theories must be tested.

In scientific research and discovery, if a theory is proposed to explain something, standards for testing that theory are set in place where all the variables are controlled as tightly as possible. If a theory has to do with the amount of electromagnetic energy in a certain substance, then a test is devised to measure that energy. For the theory to be "proven" true, it must produce the same results under the same conditions every time; if it does not, it is "falsified" and must be reworked until no further inconsistencies occur. If one measurement is evidenced 1,000 times in a row, then that measurement can be said to have a scientific basis, of a theory established. [4]

BRIEF HISTORY OF SCIENCE

Science recognizes the uniformity of nature and seeks to understand how it works. Unlike the practices of pagan religions, science is not trying to "stimulate" nature or to appease the gods of nature to cause sunshine, rainfall, or fertile fields.

"Real" science couldn't exist in primitive times and doesn't appear in primitive cultures today because of pagan beliefs:

- Nature was believed to be controlled by spirits.
- Nature was worshipped.
- Nature was manipulated by magic.
- People lived in fear of nature.

King Solomon was one of the earliest scientists in Israel. Solomon studied agriculture, animals, and minerals. He planted gardens and orchards. (Eccles. 2:5-6)

Aristotelian Science

Pagan peoples believed in gods who controlled every aspect of health and weather, while the Greeks believed in a rational universe [5] Greek science, primarily established by Aristotle (384-322 B.C.) was an important start and remained in place nearly 1500 years. Its drawbacks were its highly theoretical nature, its linking of results to objects themselves, and its propagation of many mistaken ideas. Unfortunately, these ideas became integrated into the prevailing theology, extending into the 16th and 17th centuries.

Aristotle made several significant contributions to early science:

- Principles of nature can be discovered by observation and deductive reasoning.
- Physics involves matter, space, time, and motion.
- The earth's shape was confirmed as a sphere.

However, Aristotle also

- Thought the earth was the center of a giant spherical universe.
- Held that all of nature was part of a great hierarchy.
- Held that four causes explain nature: composition, motion, shape, and purpose.
- Held that there were four kinds of matter (earth, air, water, and fire)
- Believed that change results from changing an object itself.
- Did not emphasize manual experimentation. [6]

The Scientific Revolution

Ian Hutchinson describes the "Scientific Revolution" of the 17th Century which replaced the earlier "natural philosophy" based on Greek thought and mostly contemplative, deferring to authority. Modern science, in contrast, was

- Based on observations of nature
- Experimental in nature
- Focused on facts and discovery
- Tied to measurement and mathematics [7]

Aristotelian science placed all of the motions and reactions of an object within the object itself. Modern science looked at passive objects acted upon by external forces. Modern science, as developed by Newton, Galileo, Kepler, and others, combined theory with

experimental evidence. The practice of science was tied to the "scientific method," with the expectation that knowledge would continually be revised with new findings and better experiments.

Augustine (354-430) took science seriously yet felt that science was always subservient to theology.

Thomas Aquinas (1225-1274) tied together Aristotle's approaches and theology. The Church could explain why things happened, including an earth-centered solar system.

The early modern scientists (including Newton, Brahe, and Kepler) saw science as enhancing the worship of God.

With the inputs of Copernicus, Kepler, Galileo, Newton, and Leibnitz, science changed from dependence on intuition and authority to dependence on observational data. [8]
Harrison notes these new ideas of the seventeenth century which helped to bring about the Scientific Revolution: [9]

1. Aristotle had held that natural objects possessed "intrinsic drives" which governed their motion, giving nature a measure of autonomy. The new scientists asserted that "nature was governed by God-designed natural laws."
2. These "laws" existed, paralleling moral laws, and could be discovered by man.
3. Experimental results could be expected to be repeatable since God's laws are fixed, and God Himself is unchanging.
4. Natural laws (beginning with astronomy) could be expressed in mathematical terms, and God was the Author of mathematics.

Science moved society from superstition to reality. Science provided the basis for technical advancement and progress.

Copernicus

Rhodes [10] identifies Nicholas Copernicus (1473-1543) as the true initiator of the Scientific Revolution. Copernicus described the orbits of planets, including earth, around the sun as the best explanation, undoing centuries of "science" developed by Aristotle and Ptolemy. It was not until Galileo's telescope observations that Copernicus' theory was actually verified.

Descartes

Rene Descartes (1596-1650) was a French mathematician, philosopher, and scientist. He is most famous for his contributions to analytic geometry and his quote "Cogito ergo sum" ("I think, therefore I am.") Descartes began to dismantle Aristotelean science, starting from a skepticism of established theory and emphasizing experimentation and deductive reasoning, particularly in the field of optics.

Galileo Galilei

The desire of Galileo (1564-1642) was to separate science from Aristotle and the church, using mathematical descriptions of physical events. Science would be based on experimentation rather than philosophy. One could describe a physical event without knowing exactly why it occurred. Galileo made fundamental contributions to the science of mechanics using the balance, the clock, and the pendulum. His pioneering work in astronomy verified the Copernican model of the solar system. "Mathematics," said Galileo, "is the language with which God has written the universe."

Isaac Newton

Sir Isaac Newton (1643-1727) was, by all accounts, a brilliant scientist and a believer in God and in the truth of the Bible, yet his life was a mass of contradictions. While publishing the foundational work in mechanics, he was also a student of alchemy (at that time, primitive chemistry with ancient secrets). While a member of the Church of England, he struggled with the doctrine of the Trinity. Biographers are not clear what he actually believed at various stages in his life. He was an intense student of prophecy who looked for a symbolic key to interpreting Daniel and the Revelation. Newton clearly believed that his scientific work was inspired by God and would glorify God.

Newton's contributions include the foundations of calculus, design of a reflecting telescope, the law of universal gravitation, and the three laws of motion (solid mechanics).

Newton's theology profoundly influenced his scientific method, which rejected pure speculation in favor of observations and experiments. His God was not merely a philosopher's impersonal First Cause; he was the God in the Bible who freely creates and rules the world, who speaks and acts in history. The biblical doctrine of creation undergirded Newton's science. Newton believed in a God of "actions [in nature and history], creating, preserving, and governing … all things according to his good will and pleasure." [11]

"The most beautiful system of the sun, the planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being." [12]

Francis Bacon

Although he was not a scientist himself, Sir Francis Bacon (1561-1626), a lawyer, political leader, and philosopher, impacted the philosophy of science as much as Isaac Newton did. Bacon was a British statesman and philosopher, author of the *Nouvum Organum*. His emphasis on empiricism and inductive reasoning led to his being considered the "father of modern science." Bacon urged initial skepticism regarding scientific ideas until they are proven experimentally. Bacon developed the scientific method. A devout Anglican, Bacon wrote much on theology and believed that science would both advance mankind and point to God. Bacon clearly stated that "his motivation to observe and experiment was based on the creation mandate (Gen. 1:28)." [13]

- Bacon was an advocate for experimental science and the scientific method.
- Bacon advanced inductive reasoning.
- Bacon was an advocate for applied science and what we would call "technology".
- Bacon believed in God, in the Fall of man, and in Christ's redemption.
- Bacon tied scientific advance to faith in God.
- Bacon was an advocate for the "Two Books" approach to nature and science.
- Bacon believed in the possibility of overcoming physical effects of the fall (largely through science).

We might consider three basic roots of modern science-

1. Descartes' skepticism
- No blind acceptance of a premise.
- The test of an alleged truth is the extent to which it can be proven.
- Reason is essential in the process.
- Descartes' failing: He saw reason as the avenue to all truth.

2. Galileo and Newton -applied mathematics to observed motions
- Newton's failing: He set up a "clockwork universe" in which *everything* was mechanistic and predetermined.

3. Bacon's experimentalism
- Bacon's failing: He oversold science, led to beginnings of scientism.

Why did the scientific revolution occur when it did?

I think that the best guess is that it took something that was not present in Chinese civilization, that was wholly absent in Indian civilization, and absent also from Greco-Roman civilization. It needed an idea of progress, not limited to better understanding for this idea the Greeks had. It took an idea of progress which has more to do with the human condition, which is well expressed by the second half of the famous Christian dichotomy--faith and works; the notion that the betterment of man's condition, his civility, had meaning; that we all had a responsibility to it, a duty to it, and to man. I think that it was when this basic idea of man's condition, which supplements the other worldly aspects of religion, was fortified and fructified between the 13th and i5th centuries by the re-discovery of the ancient world's scientists, philosophers, and mathematicians, that there was the beginning of the scientific age. [14]

Modern experimental science developed in western civilization, steeped in a Christian worldview. Many of the leading scientists were believers in Christ, including Isaac Newton (who developed a non-orthodox theology), Johannes Kepler, Galileo Galilei, Robert Boyle, Leonhard Euler, Blaise Pascal, Michael Faraday, and James Clerk Maxwell. They believed that their study of nature was glorifying God.

On the other hand, some of the earliest British scientists, including members of the Royal Society, were alchemists (who believed they could find the keys to transform base metals into gold and cure all diseases), elitists (who wrote only in Latin), and hermetics (who sought to recover ancient secret knowledge). [15] In spite of these aberrations, science rapidly grew into a respectable field. When we look at the real history of science it is not simple and linear like some textbooks present it.

- There were several dead ends.
- There were faulty theories held by the majority and later disproven.
- There were struggles between competing theories.

According to the famous German scholar, Anneliese Maier (1905-1971), who analyzed the thoughts of 14th c. natural philosophers and scholastic science, in his book The Predecessors of Galilei in Fourteenth Century (Rome, 1949), "the scientific revolution should not be interpreted as a linear historical process [emphasis mine] initiated by Galileo's innovation in mechanics and the increased use of experimentation thereafter". In the 17th century scholars adopted many ideas from their scholastic predecessors. [16]

Scientific discoveries that may not appear applicable at the time they are announced often yield practical results years later. Solid-state electronics, which makes computers and smart phones possible, grew out of earlier concepts from

- Quantum mechanics
- Statistical mechanics
- Materials science
- Semiconductor chemistry
- Electrical conductivity

ASSUMPTIONS AND PRESUPPOSITIONS OF SCIENCE

For the starting point of science we must ask, "What are the 'givens'?"

In all our scientific and engineering endeavors we do not begin from a void. We discover, study, describe, and use what is already in place:

- The "laws" of nature
- The elements and structures of the physical world
- The human body
- Value of people of and nature
- Moral principles

Assumptions of science

- The physical universe exists, real and independent of my perception.
- Nature is orderly.
- Natural phenomena are repeatable.
- Cause and effect relationships exist in nature.
- Natural phenomena have natural causes.
- Nature operates according to principles which we may discover.
- Nature's workings may be understood and described.
- Sense perceptions and reason are valid.

It is important to note that these assumptions are not "provable" by scientific methods.

Moreland sets forth eleven formal/philosophical presuppositions necessary for science: [17]

- The existence of an independent external world
- The orderly nature of the world
- The knowability of the external world
- The existence of truth
- The laws of logic
- The reliability of our senses to gather data
- The reliability of our cognitive faculties
- The adequacy of language to describe the world
- The existence of honest reporting
- The uniformity of nature
- The existence of numbers and mathematics

LIMITATIONS OF SCIENCE

Much of the difficulty regarding science and knowledge or science and faith (developed in detail in the following chapter) arises from an inflated view of the nature of science. While science can lead to great discoveries and advancements it is essential that we be aware of the limitations of science. Limitations arise from at least three areas-

1. Limits due to subject matter

- Science can only deal with physical objects in the physical world.
- Science can only describe one part of reality (the nature of the physical world).
- Science can only deal with what's there (not what might be there or may have been there).
- Science can only deal with what's observable or measurable.
- Science is always reductionist---can't describe everything about an object or action at once.
- Science is not reality. It can only model and explain reality. Science deals with models of reality.
- Science can only indicate that what has happened will most likely occur again.
- Science can only indicate probable repetition.
- Scientific "laws" are primarily descriptions of repeatable phenomena.
- Science can legitimately predict events only based on past observations.

2. Limits due to empirical ability

- Science is only as good as our ability to observe and to measure.
- Science is only as good as our current understanding of the world.
- We still know very little about our universe. "We will never understand the universe in detail. It is just too big for that." [18]
- Experiments are not always conclusive.

Scientific experiments are often inconclusive, particularly when considering all the physical variables that might influence an experiment's outcome. "As scientists continue to factor in more and more variables, the experiments become more complex, and comparisons between

experiments become even more uncertain."...Scientists may disagree about the adequacy of an experiment and also the competency of the persons performing the experiment. [19]

3. Limits due to the humanity of scientists

- There are no pure, totally objective scientists, only good researchers who practice science.
- Scientists are not perfectly free from bias.
- Scientists want their theories to work. A few have discredited other scientists, a few have falsified published data.
- Science is developed by fallible human beings who can observe and deduce incorrectly.

4. Limits due to the philosophy of science

- Scientific truth cannot be equated with absolute truth. There is no guarantee that forces will be proportional to acceleration every possible time. [20]
- The very presuppositions of science cannot be established by science.
- Science does not always prove hypotheses using experimentation. Watson and Crick used the experimental results of many scientists to develop the double helix model of DNA, which became the best explanation for all the observations. [21]
- Modern science (theoretical physics) is often incompatible with the scientific method.
- Science is not static but must continually change as new discoveries are made and better measurements become available. Fifty years ago, no one had a detailed understanding of string theory, black holes, or the Higgs boson.
- Science, in the past, has been flat wrong about many things. As new theories are developed and verified, incorrect theories die away. Today (except in historical reviews) no one discusses such topics as the four fundamental parts of nature (earth, air, fire, and water), phlogiston, ether, and the universe without a beginning
- Scientific history is not simple and is not merely formed by "layer upon layer" of accumulated knowledge. Thomas Kuhn's book The Structure of Scientific Revolutions [22] described the advance of science as a transition from an existing paradigm to a newer one.
- Science can't make philosophical pronouncements. Scientific laws can only describe. They can't predict or pronounce anything as good or bad (ethical).
- Science can't deal with the purpose or use of anything. Science can explain how things work but cannot explain who or why.

John Lennox tells the story of finding a frosted cake in his office. Using the tools of science, he can examine the cake to determine its size, chemical composition, mass, density, and any physical property of the cake. He still can't deduce where it came from or why it's there. It takes information outside this experimentation to know that the cake was made by his aunt Matilda and was prepared for his birthday.

Science is an approximation of the truth. The art of the scientist, and even more of the engineer, is knowing how close is close enough–when does the job we're trying to do demand higher precision, and when is such precision a waste of time? But inevitably, scientific results carry with them a small degree of uncertainty. That is precisely why they are so dangerous to use as the basis of one's philosophy, given this extreme sensitivity to starting conditions in philosophy.

Every scientific "fact," every data point, has--spoken or unspoken--error bars, those little lines on the graph that show the range of uncertainty in the data. No scientific number is perfect. No measurement is perfect. And every scientific theory, no matter how good or useful, is at best only an approximation of the truth. [23]

A wealth of material on the background of science and the intersections of science and faith can be found at the archive of the Gifford Lectures, which began in the Scottish universities in 1888. [24] While some of the presenters were non-theists (Carl Sagan, Richard Dawkins, Sean Carroll), several hold to a Biblical worldview, including Alister McGrath, John Polkinghorne, Stanley Hauerwas, Ian Barbour, Reijer Hooykaas, Donald MacKay, Alvin Plantinga, N.T. Wright, and Nicholas Wolterstorff.

SCIENCE AND WORLDVIEW

Worldview primarily plays a part in our understanding of science. A believer will see science as the study of God's Creation: the physical universe, an exploration that should actually move us to worship. A non-believer will see science as the study of the natural world, period.

Further, there is a major difference between seeking explanations for the natural world (which most will agree with) and seeking natural explanations for everything in the world (essentially assuming that nothing supernatural can exist.)

Naturalism

Most naturalists are strong proponents of science, typically proclaiming that science has "dethroned" or "buried" religion. Naturalists are clearly in touch with the physical world but cannot explain why scientific laws should exist or should be repeatable.

Naturalism is highly linked to science, particularly science replacing religion. Naturalism makes use of physical laws to explain nearly everything but cannot explain the origin of those "laws" or why we can trust that they'll be functional tomorrow.

Pantheism

Numerous scientists and engineers have come from cultures which hold to a pantheistic worldview. At first glance, pantheism, which equates God with the universe and fosters worship of nature, should strongly promote science as the study of nature, but this is seldom the case. Pantheism is not conducive to science, and the philosophies associated with pantheism cannot lead to modern science. Pantheism builds on a foundation primarily opposed to science, because of beliefs such as these:

1. Monism: The physical world is an imperfect illusion. Only the Cosmic Unity is real.
2. Isolating objects and forces for study opposes the grand unification. No true categories exist.
3. The universe is cyclic in nature, rather than liner and progressive.

4. The goal of life is not to understand the universe but to become one with it, "to lay hold of the Cosmic Self."
5. True knowledge is found by focusing inward, not outward, not on the external world.
6. "The pantheistic mindset is fundamentally opposed to inanimate forces."
7. Individuals are "stuck" in the situation they find themselves in (at least until their next rebirth.)

"Pantheistic, animistic, cyclic accounts of the generation of the universe do not place significance on a systematic investigation of the natural world because they point to some ultimate reality sundered from it." [25]

"If you were born into a culture infused with pantheism, might you feel powerless to impact your destiny? Why would you have any motivation to understand how the physical world works? Why would you have any reason to think you could improve your lot in life? Why would anyone think in terms of progress? Progress to where? Perpetual cycles do not progress." [26]

Theism

Theism is strongly tied to the origins of modern science and sees the physical laws as part of God's design and open to our discovery.

Theism fits well with science, since the theist affirms the reality of the physical world, the value of studying it and, in part, modifying it, and the existence of God continually controlling and maintaining the universe in an orderly manner.

Theists expect an orderly universe and are not surprised by a comprehensible universe with fixed laws held in place by a sovereign Creator.

Cultural worldview and science [27]

In the Premodern mindset, people understood that God was sovereign and directly controlled nature while indirectly controlling man (through kings and bishops). There was comfort in God's control, but little freedom or discovery. (Not really Biblical explanations.)

In the Modern mindset, scientific laws explained how nature functioned. Church and government authority were questioned. Human progress would be based on science, and there was no more need for God.

In the Postmodern mindset, the conclusion is that science and social progress have failed to deliver. No unchanging truth is expected.

What we need is not a return to the Premodern mindset but to a true Biblically based "transforming vision."

Christian basis of science- Some Premises [28]

1. God gave all of this created world to mankind as theirs in order that they might express their "God-likeness." (Gen. 1:26-31)
2. God gave to mankind great ability to plan and accomplish amazing things in this world. (Gen. 11:1-9)
3. The process we call science is part of this assigned ability. Man does not "create" in science, but rather discovers. God has already placed the possibilities for these accomplishments of mankind in creation. In science we seek to understand, use, manipulate, control, and develop what God has already designed there
4. God placed limits into creation, some of which are stated in scripture. Some of these limits include reproduction of animals "after their kind" (Gen. 1:11-25), space and time, and beginnings and endings of life.

The nature of God as both Personal and sole Creator (no local gods or nature or idols) is key to the existence of science in the Judeo-Christian tradition.

(The) only historical basis for good science and the scientific method is located in the opening chapters of Genesis. In Genesis 2, for example, the sun, moon and the stars are viewed as inanimate objects, and not as god and goddesses as with all pagan religions. Secular thought, whether partially founded in Confucianism, or more particularly in the Greek Epicurean, Stoic and Cynic philosophers, was unable to rise above the ethics of pagan religion while challenging their existence. The Bible embraces no mythologies, and views things as they are, which is the predicate for the very nature of science -- observable data. [29]

In addition, the concept of truth is fundamental to scientific experimentation:

(T)he ethics of the requirement for Hebrew prophets to be 100 percent accurate when they speak in the name of Yahweh precedes the ethics necessary for the principle of falsification which is at the core of the scientific method. All scientific theories are to be tested under stringent conditions and must always produce the same results to be considered "proven." And all that which is proven can be disproven, if say, after 1,000 experiments with the same result, a different result occurs on the 1001st time, given that all the testing variables are the same. So too, Jesus challenged his enemies in John 8:42-47 and 10:34-39 with a sophisticated use of the "if" clause, giving them freedom to prove him wrong if possible. Truth uniquely can afford to welcome such challenges. [30]

The vast majority of observed actions in our world can be traced back to physical causes (which, we assert, God made possible). Scientific explanations for nearly everything on earth should sit well with 21st Century Christians. It is only when we deal with the area of miracles (which are exceptional) or the area of origins, of the universe or life, where we bump against the limits of science and find explanations in God's direct actions.

The Bible and science

As we go through the Bible, we find numerous concepts related to science:

1. God created the heavens and the earth and gave use of the earth to man.
2. Adam was, in a sense, the first scientist, since God gave him the task of naming (classifying) the animals. (Gen. 2:18-20)
3. "Having dominion" (Gen. 1:28) includes studying and understanding the world.
4. God's questions to Job included these: "Can you bind the sweet influences of (the star cluster) Pleiades, or loose the bands of (the constellation) Orion?" (Job 38:31)
5. The Bible speaks truthfully about parts of nature, beyond what was known in the culture:
    - Increasing complexity of creation and animal life (Gen.1)
    - Importance of sanitation
    - Circle of the earth
    - Earth hung in space
    - Paths, circuits of the wind
    - Life is in the blood (Lev. 17:11)
6. King Solomon dedicated a portion of his time and wealth to study plants and animals.

"And he spoke of trees, from the cedar tree that is in Lebanon even to the hyssop that springs out of the wall: he also spoke of beasts, and of fowl, and of creeping things, and of fish. And people came to hear the wisdom of Solomon, from all kings of the earth, who had heard of his wisdom." (1 Kings 4:33-34)

King Solomon, a true man of God, one of the wisest men that ever lived, was a "scientist," in the sense that he appreciated and studied "nature" - all without arrogantly ignoring (ignorant is based on the word ignore) or denying the Creator of it. Solomon wasn't a God-denying sham scientist. [31]

7. We are encouraged to study the world God made.

"It is the glory of God to conceal a matter. It is the glory of kings to search out (research) a matter." (Prov. 25:2)

8. The incident on Mount Carmel was a great scientific experiment.

A great experiment is recorded in 2 Kings 18, where God's prophet Elijah confronts the priests of the idol Baal. The hypothesis is that the God who is really there will send fire to His altar. Elijah mocks the Baal followers as they grow desperate for some sign. ("What's the matter with Baal? Is he asleep? Is he outside your area code? Is he using the restroom?") If Baal is God, let him respond. If YAHWEH is God, let Him fire the sacrifice. Just to make it fair, and obvious, let's soak the altar of YAHWEH with water. Elijah cries out to God, and fire falls from heaven, consuming the altar. The God who answers by fire, He is God.

9. Daniel and his friends were among those Babylonian captives from Israel who were "children in whom was no blemish, but well favored, and skillful in all wisdom, and cunning in knowledge, and understanding science..." (Daniel 1:3)
10. By Jesus' day the people of the Middle East knew several basic things about weather, agriculture, construction materials, and metallurgy.

The Bible speaks truthfully about the world but does not (and is not intended to) give us

principles of physics, chemistry, geology, or biology.

The Bible doesn't read like a science textbook. It reads more like a history book in several chapters. It uses common speech, not scientific descriptions. It often uses phenomenological language and common idioms (the sun rises and the sun goes down, the four corners of the earth, the treasures of the clouds, formed in the lowest parts of the earth…). It is not precise in the use of numbers, typically rounding off large numbers. It often leaves out descriptions and details. (None of this is actually anti-science.) It had to be understandable in Moses' day as well as today in any culture.

Jesus taught the disciples within the context of their experience.

Jesus put forth another parable unto them, saying, "The kingdom of heaven is like a grain of mustard seed, which a man took, and sowed in his field, which indeed is the least of all seeds, but when it is grown, it is the greatest among herbs, and becomes a tree, so that the birds of the air come and lodge in its branches. (Mt. 13:31-32)

Of course, God knows that there are seeds smaller than a mustard seed (He made them, after all), but the disciples were only familiar with mustard seeds as small.

There is no magic in the Bible (except for the magicians of Pharaoh's court and the books of magic in Ephesus) and no spirits of nature. In a few instances the scripture actually describes a physical cause for a specific miracle. (God used a strong East Wind to part the Red Sea-Ex. 14:21.)

The Bible tells us true things about people and about nature…Yet because the Bible does not give exhaustive truth about history and the cosmos, historians and scientists have a job to do, and their work is not meaningless…Man can know both truth about God and truth about the things of creation because in the Bible God has revealed himself and has given man the key to understanding God's world. [32]

God and the Laws of Nature

Ps. 119:90-91 tells us that God's ordinances (laws) keep the earth in place. Man may or may not obey, but the sun, moon, and stars will always obey the Creator.

Modern experimental science arose in a culture where people recognized an orderly universe, a beneficent Creator, repeatable natural laws, and the possibility of learning and progress. Bacon, Newton, Kepler, Galileo, Boyle, Pascal, Faraday, and Maxwell were classical scientists who believed the Bible.

Modern electrical engineers draw from the earlier work of several scientists and engineers (Hamilton, Maxwell, Boltzmann, Schrodinger, and Einstein) who have collectively distilled the physical laws that God set in place into a handful of mathematical equations which lie at the heart of all modern science. [33]

Science and God's sovereignty (By Bill)

God's sovereignty means that

- Subatomic particles can move randomly, yet whole atoms always act in a prescribed way.
- Heated gas particles can arrange themselves---
- An enemy may attempt to do harm or evil, yet God can turn the result to good. (Joseph- Gen. 50:20)
- Every person on earth can make real decisions, yet God's ultimate purposes will be accomplished. (Acts 4:26-28)

Positive Value of Science (By Paul)

1. Science points to God's order, majesty, and power.

What might we conclude about God by looking at the created world?
On the large scale we see order, balance, repeatability, beauty. These things must matter to God. One thing we can't conclude from nature is how we should live. That requires special revelation.

2. Science helps us to understand creation.

Science "unlocks" or "unwraps" parts of creation to use for good, particularly in medicine, chemistry, and basic engineering science.

God's gift of creation comes wrapped! It comes in layers, with certain aspects hidden until we unwrap the gift. It is a boundless gift - we can plumb its depths again and again, finding more each time. Scientists are never done with their job of exploring God's creation and discovering what makes it tick. We are called not only to discover, but to till a garden in this fertile soil. Engineers are never done with their job of developing creation in service to humans, in care of the creation, in praise of our Creator. Technology is a wonderful expression of the useful qualities of the materials God has provided. [34]

3. Science, understood as the study of what God made, should lead us to worship.

How Faith Affects Science

Materials scientist Richard Bube wrote the following: [35]

"My faith is that God has created and sustains the universe, and my scientific task is to try to describe in the scientific categories available to me how it is that God does this".

1. My faith provides strong motivation for doing scientific research. With the conviction that there is indeed a reality that can be addressed by scientific research, I can enter into the joy of "thinking God's thoughts after him," and helping to unravel the complex structure of the world.

2. My faith provides a worldview and an ethical sensitivity that allow me to decide which areas of scientific work are the most appropriate in terms of knowledge gained and human conditions helped.

3. My faith provides a framework of values within which it is possible to evaluate a particular career choice or involvement in scientific work. I deliberately chose a definition of excellence (or success) as referring to a life lived after Christian standards, rather than a definition as calling for a life that is better than anyone else's in scientific career development and position.

4. My faith enabled me to be open to the apparent descriptions of modern science, no matter how difficult or unexpected they might be, while at the same time protecting me from falling into non-Christian extrapolations or generalizations of these results beyond the range of authentic science.

5. My faith has reminded me of the importance of personal relationships in daily life with the people with whom I work and relate - colleagues, students, and staff. My work also is expressed by my life in the office and lab, and this is guided by my faith.

Karl Kienitz explains his position this way: [36]

To do science, it is necessary to assume that the universe and nature are intelligible to the human mind. What are the metaphysical and epistemological assumptions that justify the scientific activity?

In the following I list examples of philosophical beliefs that encourage scientific research:

• Events in the natural world typically have (immediate) causes in the natural world.
• Time is "linear."
• Causes and effects in the natural world have some regularity in space and time.
• Causes and effects can be - at least partly - rationally understood.
• The fundamental constituent of natural behaviors cannot be deduced by logic from fundamental principles. We use observations and experiments to extend our logic and intuition.
• Studying nature by the means just described is a worthwhile investment of time and talent.

SCIENCE AND THE FALL

Since the Fall has impacted all aspects of society, we should expect the human sinful bent to have a strong impact on science:

- Some have pursued science for their own glory and advancement. [37]
- Science has been held out as the explanation for everything.
- Dawkins: Science has replaced God in the minds of many.
- Scientific experimental results have occasionally been deliberately misrepresented.
- Scientific findings have been misused to injure or destroy others.

Modern science did not arise form pure humanism and progressive ideas. Bacon and others held to a real Fall and the need to restore man's knowledge and this world.

"Francis Bacon, as is well known, saw in the science the prospect of restoring, or at least repairing, the loss of knowledge that had resulted from the fall". [38]

POSITIONS REGARDING SCIENCE & FAITH

Thinkers have held a number of views on the relationship between science and faith (or sometimes "religion"):

Bube outlines seven viewpoints for the interaction of science and theology [39]:

1. Warfare concept - Science and faith are totally incompatible and, in fact, in conflict with each other.

In the extreme, some believe that modern science has destroyed Christian theology. This is the position of the modern militant atheists. They claim that science has proven that there is no God or supernatural phenomena and that miracles cannot occur.

Wenham writes-

It is always helpful, therefore, to bear in mind John Hedley Brookes' comments, when he reminds us that: "In many of the disputes that have been conventionally analyzed in terms of some notional relation between science and religion, the underlying issues were principally about neither science nor religion, nor the relationship between them, but were matters of social, ethical or political concern in which the authority of either science, religion or both was invoked (often on both sides) to defend a view held on other grounds...[40]

The following chapter will examine the "warfare" model in some detail.

2. Christian theology in spite of science.

Bube calls this "theistic science." God's direct actions must be included in all scientific descriptions.

3. Science and Christian theology are totally unrelated.

Some refer to this position as "NOMA"- "non-overlapping magisterium." This was the position and terminology of biologist Stephen Jay Gould: No conflict exists between science and faith because they address totally different areas of inquiry, have different goals, and use different methodologies.

"Each domain of inquiry frames its own rules and admissible questions and sets its own criteria for judgment and resolution". [41]

This is pure compartmentalization - "never the twain shall meet." While they differ in goals, they should not be completely isolated.

4. Science defines Christian theology.

Science provides arguments and evidence for the existence of God.

In the "concordist approach" It is possible to reconcile many of the statements of scripture with the findings of science.

5. Science redefines Christian theology.

In this position science trumps theology, and all theology must be reinterpreted in the light of science.

6. A new synthesis of science and theology.

Most of this is New Age thought tied to concepts from quantum mechanics.

7. Science and Christian theology provide complementary insights.

There is one God and one reality but different insights from different approaches.

Certainly some overlap occurs: Religion and science may deal with different subjects (science doesn't address justice, love, or worship; Scripture doesn't address thermodynamics or fluid mechanics), but in various cases (earth, plants and animals, sun, humans) they deal with the same common things.

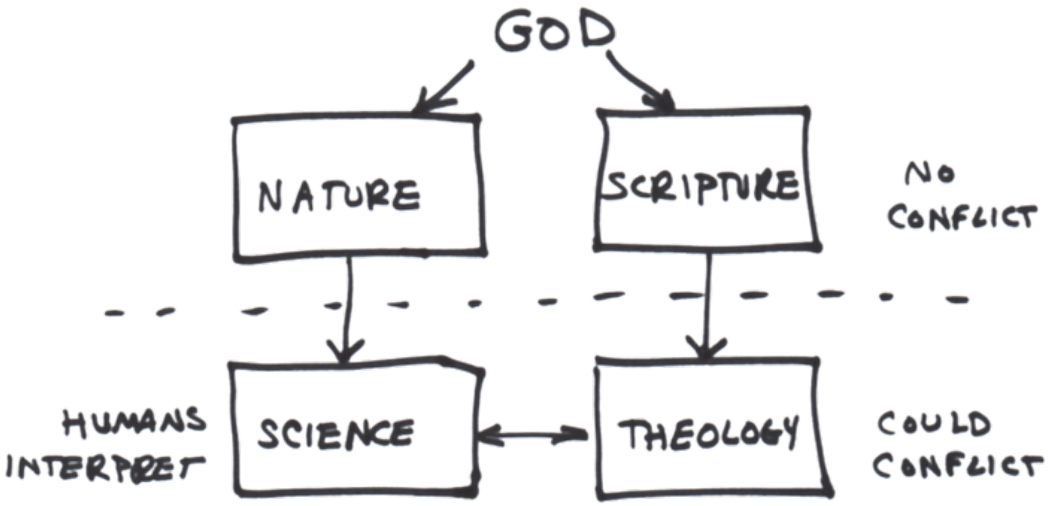
THE "TWO BOOKS" ANALOGY

It is important to realize that the issue really is not science vs. the Bible or nature vs. religion. To phrase it in those terms is to compare "apples and oranges." The Bible and the universe are givens, God-given according to Christians. Theology and science are the corresponding human interpretations of what God has given. It is at this level that we might have disagreements.

Instead of looking at nature and the Bible as our starting points, it might be more productive to state that we want to look at Creation and the Bible, since nature could involve our sense experience of the world, while Creation refers to all that God has made.

Augustine of Hippo (354-430) proposed the idea that "God has written two books": the Book of Nature (the world that we see) and the Book of Scripture (the Bible). The former is considered to be "general revelation," available to all to show the world that God is there. The latter is God's "special revelation," explaining His character and how to relate to Him.

Nature-general revelation- can show us the reality of God (Creation) but cannot show us God's salvation. For that we need the Scripture. Christians understand that unlike other books, the Bible is uniquely inspired by God and requires God's Spirit to comprehend spiritual truth. Science is derived by man from the "Book of Nature," and theology is derived by man from the "Book of Scripture." Since God is the Author of both Books, they cannot contradict each other.



The two "books" tie to the two halves of Psalm 19:

1. General revelation: "The heavens declare the glory of God, and the firmament shows forth His handiwork." (Ps. 19:1)
2. Special revelation: "The Law of the Lord is perfect, converting the soul." (Ps. 19:7)

Augustine expressed the idea this way:

Some people, in order to discover God, read a book. But there is a great book: the very appearance of created things. Look above and below, note, read. God whom you want to discover, did not make the letters with ink; he put in front of your eyes the very things that he made. Can you ask for a louder voice than that? [42]

It is the divine page that you must listen to; it is the book of the universe that you must observe. The pages of Scripture can only be read by those who know how to read and write, while everyone, even the illiterate, can read the book of the universe. [43]

Francis Bacon wrote:

"God has, in fact, written two books, not just one. Of course, we are all familiar with the first book he wrote, namely Scripture. But he has written a second book called creation." [44]

Bacon later urged continual study and "an endless progression of proficiencies in both."

Summary of Nature and Scripture (primary revelation)

Book of Nature	Book of Scripture
Began at Creation	Revealed over hundreds of years

Book of Nature	Book of Scripture
Perfect at Creation Fallen (since Gen. 3 events)	Perfect (as originally revealed)
Understandable by all	Requires the Holy Spirit to properly grasp
Will eventually wear out (and be renewed)	Settled forever
Reveals God as powerful Creator, Maker of Heaven and Earth	Reveals God as Creator, Savior, Redeemer, Triune Lord
Involves some natural processes but is fully controlled by God	Involved human speakers and writers but is fully inspired by God
"General revelation"	"Special revelation"
Created by God in the beginning	Inspired by God over some 1600 years
Available to all; should be understood by all	Needs to be available to all; the Holy Spirit helps to understand it
Declares the glory of God (Ps. 19)	Declares God's salvation (John 3)
Shows God's order, beauty, and power	Shows God's grace, mercy, and love
Interpreted in depth in science	Interpreted in depth in theology
Created perfectly; suffers some effects from the falll	Revealed perfectly; has been copied and translated without destroying the message

Nature and Scripture are original sources. Both require interpretation. Both can be misunderstood.

Younker questions whether God's original and primary purpose in creating nature was to reveal Himself to those He created. He concludes that this was not God's major goal for several reasons: [45]

- Humanity had "direct access" to the Creator before the Fall.
- God created the earth to be inhabited by humans created in His image.
- God's revelation through nature has been affected by sin and the Fall.
- God never intended nature to be a complete revelation, since He included later revelation through His Word and through Christ.
- God's written revelation is propositional, addressed to our minds and spirits.
- Nature's revelation is not explicit and requires inference or assistance to nail down its meaning.

Science and Theology

Science and theology are human interpretations of God's two books

- Both are based on God's revelation, general and specific.
- Both can help us understand God better.
- Both are based on assumptions.
- Both assume reality exists and can be understood, at least in part.
- Both apply human reason to the given facts.
- Both use logic, reason, and evidence.
- Both can be (and have been) misinterpreted
- Both require humility when we deal with them

Bube notes these common features between science and theology: [46]

1. Both are based on faith commitments. For science there is a commitment to the intelligibility of the world and the possibility of understanding its workings.
2. Both develop descriptions of reality based on evidence. Valid descriptions must be testable.
3. Both describe a part of reality and yield models to help us understand reality.
4. Both are dealing with the same reality.

We have looked at some assumptions of science. What are the key assumptions of theology?

- God exists.
- God has communicated truth in His Scripture.
- God's message is consistent and unchanging.
- We have reliable translations from the Hebrew and Greek manuscripts.
- We can understand, systematize, and express aspects of God's truth in human language.
- We can find and organize patterns in Scripture.
- Christian theology is based on events that happened in history, not mythology.

- Miracles really happened, as God intervened in His Creation.
- Theological thought is not unique to the reader.
- The same facts are available to all.

Believers make similar presuppositions regarding nature:

- God exists.
- God has created to reveal Himself.
- What we see is real and not illusion.

Both science and theology must remain true to their sources (nature, scripture) and must make statements that agree with reality.

Theology should inform our understanding of nature (We are made of matter, but we are far more than matter), and science should inform our understanding of scripture. [47] ("Four corners of the earth" is a figure of speech.)

Scripture- God used human men to write the Bible, but it was His intended message.

Nature- God uses natural processes to shape nature, but it is His Creation.

Science and theology are asking different questions:

- Science asks what is present and how does it function?
- Theology asks Who was involved and why?

Polkinghorne quote-scientific knowledge and religious knowledge

SCIENCE AND INTERPRETATION

Theologian-mathematician Vern Poythress writes that both Scripture and nature contain facts that require careful interpretation. Hermeneutics is the practice of scriptural interpretation. In his book Science and Hermeneutics seminary professor Vern Poythress notes the parallels in interpreting the "givens" and concludes the following: [48]

- Facts are always value-laden
- Look for patterns and repetition
- Relate to previously established truth
- Understand the use of models and analogs (e.g. tabernacle and feasts)

Ultimately, we need the Holy Spirit to help us interpret scripture.

Physicist Steve Ball notes the importance of the single Author for the "Two Books." Just as God used ordinary (physical) men to write His ideas into scripture, we might expect that He could use ordinary physical laws to bring about details in the Book of Nature. His imprint should be clearly visible.

The earth as we see it today is continually being transformed by natural forces (wind, water, heat), in a way that God planned. We need to be very careful of an extreme position that says, "The Two Books idea is a false idea. We can only trust Scripture. We can't begin to trust nature." This is not a Biblical claim and is actually a rejection of God's Creation. God gave us nature to provide for physical needs (food, clothing, shelter, medicines) and also to point to His reality, power, and care (Ps. 19, Rom.1). [49]

Craig Rusbult offers the following guidance: [50]

What does theology say about physical reality?

First, instead of thinking "natural" means "without God," Christians should see natural process — which is the focus of study in science — as being designed and created by God, and perhaps guided by God. We believe that God can use natural process to change our situations and our thoughts and actions, and that He responds to prayer, usually in ways that appear normal and natural.

Second, the Bible teaches that although God's activities in physical reality usually appear natural, occasionally His actions appear miraculous. Therefore, when we are trying to understand what is happening now and what has happened in the history of nature, the range of possibilities is expanded because we believe that God can act in ways that appear either natural or miraculous.

In the ASA journal, Perspectives on Science and Christian Faith, George Murphy looks at the "two books" concept, and explains why it's better to use scriptural theology (based on the Bible) instead of natural theology (based on what we see in nature) as a foundation for building our understanding of God, especially the character of God: "We should begin with the knowledge of God revealed in the history of Israel which culminates in Christ. Then we know that the creator, the author of the book of nature, is to be identified with the crucified and risen Christ, and we can read the book of God's works in that light. ... We can learn about nature simply by reading the book of nature. But that book will tell us something about its author only if we have first read the Bible and understood its witness to Jesus Christ." [51]

Finally, Mann summarizes the "two books": [52]

1. *The Book of Nature is clearly revelatory of God's providential work in Christ, and even nonbelievers are capable of comprehending its complex order through the proper use of reason and experience (i.e. science properly understood).*
2. *The Book of Scripture is clearly revelatory of God's providential work in Christ, and therefore is true and authoritative in all matters. The problem is that we often misinterpret Scripture by imposing our own preconceptions upon it rather than allowing it to speak for itself.*
3. *God's two books can and should be read together in harmony when we are open to allowing them to speak for themselves on their own terms. Ultimately, they cannot contradict each other because the source of both is the same God and if they seem to be in contradiction it is because we have misread one or both of them, and we need to be willing therefore to allow ourselves to be open to thinking about either one in different ways, trusting that God will ultimately lead us to see the truth of the whole.*

SCIENCE AND ETHICS

Certain ethical guidelines should be observed in the practice of science, such as:

1. Scientists should promote openness and transparency.
2. Scientists should avoid conflict of interest.
3. Experimental findings must be carefully measured and honestly reported.
4. Personal interest and bias on the part of investigators must be removed. Findings must be followed up, even if they contradict my theory.
5. Reviewers must judge a scientist's work impartially, based on the validity of the data and conclusions.
6. Animals used in research must be treated ethically.
7. Humans cannot be harmed in any way during research. Humans used in research must be informed of any possible dangers and must provide conscious consent to participate.
8. Scientists should be aware of the potential uses (and misuses) of their discoveries.
9. Scientists should keep the public informed, issuing all statements in a truthful manner.
10. Scientists should practice good stewardship of resources and the environment.

All of these are consistent with Christian truth and behavior.

CONCLUSIONS

Modern experimental science arose in a culture where people recognized an orderly universe, a beneficent Creator, repeatable natural laws, and the possibility of learning and progress. Bacon, Newton, Kepler, Galileo, Boyle, Pascal, Faraday, and Maxwell were classical scientists who believed the Bible.

Science is based upon assumptions and bounded by limits. Charles Hummel summarized these limits of science [53]

1. Science is one partial approach to describing reality (others include writing, painting, photography, and poetry as descriptions of the real world.)
2. Science can measure, observe, and express things mathematically (and in the terms of science).
3. Science is incapable of telling why things happen.
4. Science requires theories and experiments to test the theories.
5. Science presupposes cause and effect, an orderly world, and repeatable experiments.

Both Scripture and nature are given by God as revelation of His glory and cannot contradict each other. Most of the difficulty we have is not with pure scripture or pure nature but with our attempts to process them for our thinking. Theology is man's attempt to analyze Scripture. Science is man's attempt to analyze nature. [54]

Nature proclaims its Creator; Scripture tells you who He is. Nature shows you the results of His deeds in creation; Scripture tells you the results of His deeds in history. Nature manifests to you His moral requirements; Scripture tells you what to do about the fact that you don't measure up to them. Scripture is more important because it tells you the plan of salvation, but not even

scripture makes nature superfluous. [55]

Polkinghorne summarizes the matter this way:

I believe that science and religion are intellectual cousins under the skin…They are both part of the great human endeavor to understand…A major difference between scientific knowledge and religious knowledge lies in the consequences they have for us. My belief in quarks and gluons is intellectually satisfying, but it doesn't affect my life in a radical way. God, on the other hand, is not just there to satisfy our curiosity. The encounter with divine reality will involve the call to obedience as well as the illumination of our minds. While it requires scrupulous attention to matters of truth, it also calls for the response of commitment to the truth discovered. [56]

Clearly, some humility is needed. We understand some things very well, some things a little, and some things hardly at all. Limited human minds interpret both nature and Scripture. There's a great deal we don't understand about the substructure of the atom and the far reaches of space. On the other hand, Newton's laws in the dimension of human construction are so well-established that they will not be revised. Similarly, there's a great deal that we don't know orunderstand about future events or the details of the distant past from Scripture. We can, however, be confident about the death and resurrection of Christ, and we have proven over a couple of thousand years that trust in Christ brings about changed lives.

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CHAPTER 12: FAULTY UNDERSTANDING & FAULTY USE OF SCIENCE

INTRODUCTION

"Ladies and gentlemen prepare to view an incredible struggle, a fight to the finish. In this corner we have Science, which has brought us enormous progress and prosperity, lifting us out of the Dark Ages. In the other corner we have Religion (Faith), which always hinders the advancement of humanity. Let the battle begin!"

That's how it often seems, an ongoing fight between Science and Faith, and the sense of struggle goes both ways. Many people of faith see science as an enemy and oppose the idea of their children studying advanced science. Many in science see facts and reason on their side and faith as feelings at best, or superstition at worst.

Some of the opposition is deserved: Christians have sometimes gotten off the track with a "God of the Gaps" mentality, a mechanistic view of reality, or misunderstandings of the concepts of relativity, uncertainty, and entropy.

Those who hold that science can explain everything have grossly over-reached. At the same time, a number of recent scientific discoveries look like they're lining up with the Bible.

NO GOD OF THE GAPS

In primitive cultures most complex activities of nature (lightning, hail, windstorms…) were attributed to the supernatural, to gods and spirits, since their causes were not understood. In

Christian cultures in earlier times many areas of nature and science that weren't clearly explained were attributed to God and often used as evidence for God. Such explanations later came to be known (and disparaged) as "God of the gaps" arguments. God becomes the explanation for everything we don't understand. This is bad science and poor theology. God is the Creator and Sustainer of everything in the universe, what we do understand and what we don't (yet) understand.

"God of the gaps" thinking posits God as the direct (hence, miraculous) cause of observed phenomena, not allowing for the operation of (God-ordained natural laws). As scientific understanding increases (We understand some of the physics behind lightning and hail, for example), the gaps decrease and the need for God as explanation for unknown phenomena disappears.

Some of the difficulties with both sides of the argument:

- We don't even know what our scientific knowledge will be in the future.
- Only if a question could possibly be answered scientifically is a God of the gaps argument meaningful. "Why does the Universe exist?" can never be answered scientifically.
- Many naturalists believe that eventually everything will be successfully explained by science. We might call this a "science of the gaps" or "nature of the gaps" mentality.

When critics mistakenly assume that Creator-friendly views use the "god of the gaps" fallacy, it leads them to impose another faulty accusation. They maintain that the "God did it" mentality stifles motivation for meaningful scientific inquiry. Science Historian at Cornell University Will Provine "described intelligent design as an 'utterly boring' theory, one that offers the 'same answer for every irreducible mechanism.'" And since science can't be done without an innate curiosity, they reason, creationists are not actually scientists...

(M)any of the same critics who swing the "god of the gaps" club at their ideological competitors, nonetheless, take refuge in their own "nature of the gaps" reasoning. Nature is assumed, for example, to have spontaneously generated matter from nothing; atoms, galaxies, stars, and planets from an explosion; and life from non-living soup. Well-educated people, wise enough to include the Creator in their thinking, need not fear the specious accusation that they are relying on the "god of the gaps." [1]

We must be careful not to make what we can't understand or can't measure a place for the "God of the Gaps":

- Dark matter
- Dark energy
- Uncertainty at the atomic level
- What holds the atom together?

John Lennox notes that the gaps in our knowledge gradually disappear over long times and wisely comments, "If you define God to be the explanation for what science hasn't yet discovered then you must choose between science and this God." [2]

Genome scientist Francis Collins writes: "Faith that places God in the gaps of current understanding about the natural world may be headed for crisis if advances in science

subsequently fill those gaps."[3]

The God we worship created and holds together all those things that we now understand and can explain as well as the things we can't explain.

THE UNIVERSE IS NOT MECHANISTIC

Isaac Newton's legacy included both classical mechanics and the idea of a mechanistic "clockwork universe," in which nature is highly predictable. Since God created and controls the actions of the Universe rather than whimsical pagan deities, nature becomes comprehensible but also deterministic. In the extreme, however, the results would be

- Determinism
- No miracles
- An impersonal God
- Humans would be machines

Physicist Donald MacKay examined the question of human free will if the universe were fully mechanistic/deterministic. [4]

William Paley built on the machine idea in presenting his argument for God: the existence of a complex watch mechanism implies the existence of a Watchmaker. Paley made one of the earliest cases for design in nature ("natural theology,)" but his view of the universe is highly mechanistic, and his Watchmaker is not necessarily the Infinite –Personal Trinitarian God of the Bible.

In fact, the universe is highly complex and only partly predictable. At the subatomic level most is unpredictable.

The picture from Scripture is that God designed and controls the laws of nature and yet is personally involved with our planet:

- He sends the rain and the snow (Job 37:6)
- He clothes the grass of the field (Matt. 6:30)
- He sees the sparrow fall (Matthew 10:29)

The key to how we handle the physical regularity of the universe hinges on our worldview:

As (John Hedley) Brooke summarizes, "By speculating, for example, on the mechanism by which God reformed the solar system, [Newton] drew attention to the role of providence in nature–but at a price. Those who did not share his religious sensibilities would look at the mechanism and see no further." In other words, your conclusions depend on how you look at the mechanical laws. Depending on your presuppositions, you might see a watchmaker, or alternatively you might see a mechanism that runs by itself. [5]

Relativity is not Relativism

I cringe when I hear non-scientists attributing modern social relativism to Albert Einstein. Einstein developed the theory of general and special relativity, emphasizing the frame of reference of the observer in physics and the relative motion between objects. He never endorsed moral-cultural relativism, which is a philosophical position.

Various writers who don't come from a scientific background have suggested that Albert Einstein is to blame for our current national problem with moral relativism. Biographers of Einstein make it clear that Einstein never wrote about relativism and would have rejected the concept of relative morality. Among Einstein's famous contributions to physics was his theory of general and special relativity, which focused on moving versus stationary observers and the changes in time and mass that would occur as objects are accelerated to nearly the speed of light.

As the twentieth century unfolded, Einstein's theory of relativity quickly became a symbol and catalyst for something very different—the development of moral relativism.

Einstein was not a moral relativist, nor did he believe that his theories had any essential moral or cultural meaning. He recoiled when his theory of relativity was blamed or credited for the birth of modern art (Cubism, in particular) or any other cultural development.

The philosopher Isaiah Berlin defended Einstein against any such charge: The word relativity has been widely misinterpreted as relativism, the denial, or doubt about, the objectivity of truth or moral values." He continued, "This was the opposite of what Einstein believed. He was a man of simple and absolute moral convictions, which were expressed in all he was and did. [6]

The Uncertainty Principle is not Cognitive

The Uncertainty Principle as developed by Werner Heisenberg has nothing at all to do with our ability to know some truth with certainty. It applies only at the subatomic level to the motion of an electron (We can't know exact position and momentum simultaneously.)

The term "uncertainty principle" suggests some grand philosophical idea, like "you can never be sure of anything", or "there are some things you can never be sure of" and sometimes people use it as if this is what is meant...In fact, this principle discovered by German theoretical physicist Werner Heisenberg in 1927, has a precise technical meaning that's typically relevant only to microscopic particles. [7]

Entropy is not the Enemy

It has been suggested in popular discussion and sermons that the second law of thermodynamics came into effect at the time of Adam's sin, changing the world because of the Fall, but this is not borne out by the scriptural account or the scientific data.

Entropy is a thermodynamic quantity, defined as a measure of the unavailable energy in a closed system or the ratio of heat flow to temperature. The Second Law states that the total energy of a closed system cannot decrease. Clausius related entropy to a measure of the randomness of disorder of a system. The observation is that nature in general (or matter in an isolated system) tends to move from order to disorder. We don't naturally observe things becoming more structured and orderly by themselves. But is entropy necessarily a bad thing?

One of the most important facts about living systems is that they are entropy generators. The processing of food is an irreversible process that produces entropy. The transport of chemicals into and out of cells is an irreversible process that that produces entropy. Any process that involves viscosity, diffusion, or resistance leads to the production of entropy. Life is an inherently non-equilibrium, irreversible process! [8]

Walking is implied for both Adam and animals. However, walking requires friction, and friction dissipates energy, usually in the form of heat. This is energy that cannot be recovered and hence is unavailable for work. Hence, energy is no longer useful for work, in accordance with the second law of thermodynamics. Even seeing the sun and stars depends upon the second law of thermodynamics, because the surfaces of the sun and stars are hot, and the second law insures that heat flows via radiation from the hotter locations to cooler locations. [9]

Energy changes and order losses are a part of digestion, part of animal motion, and part of star burning, all of which existed before the Fall. There is no reason to think that the earth as originally created was a frictionless surface or that stars shone by some different mechanism.

Science-Religion Warfare Concept

Opposition to Christianity has been promoted by a number of scientists, including

- Richard Dawkins (The God Delusion)
- Daniel Dennett (Breaking the Spell: Religion as a Natural Phenomenon)
- Sean Carroll (The Big Picture)
- Steven Weinberg (Without God)
- And the late Carl Sagan (Cosmos).

Newton made a distinction between omitting religion from scientific consideration and outright opposing religion:

Despite his intense biblical study and belief in a creating God, Newton observed the distinction between religion and science made by Galileo: "The Bible tells us how to go to Heaven, not how the heavens go." During his presidency of the Royal Society, Newton banned any subject touching religion, even apologetics. He wrote, "We are not to introduce divine revelations into philosophy [science], nor philosophical [scientific] opinions into religion."…Yet for Newton this distinction was not a divorce, much less a conflict. Although the books of God's Word and his Works were not to provide the content of each other's teachings, they were bound together. Newton did not consider one to be sacred and the other secular, nor did Copernicus, Kepler, Galileo, or Pascal—all practicing Christians. Only later Enlightenment philosophy produced a model of "warfare" between science and theology. [10]

We can possibly date the concept of science-religion warfare to the last quarter of the 1800's. In 1874 John William Draper published A History of the Conflict Between Science and Religion. It was neither good science nor good history but primarily an anti-Roman Catholic "diatribe." [11]

The notion of conflict between science and religion became especially prominent in the last third of the 19th century with the appearance of (a best- selling book.)...Andrew Dixon White (then president of Cornell) published the fullest treatment of this in 1896 in a two-volume work called "A History of the warfare of Science with Theology in Christendom." He tried in that work to identify the source of conflict as dogmatic theology. [12]

The books by Draper and White were far from unbiased science:

To find the origin of the conflict or warfare thesis for science and religion, we have to go to the late 19th century, particularly to two men. John William Draper, an English immigrant to the United States in the 1830's, first president of the American Chemical Society, and an amateur historian; and Andrew Dixon White, a senator in the New York State Legislature and first president of Cornell University. Each of them wrote a book on the conflict, in the case of Draper, or the warfare of science and religion, in the case of White. They gave this historical view that science and religion have always been at odds. The impetus behind both of these is not particularly historical. It's rooted in political and social events of the time. The real reason that White was writing, he says he was reacting against sectarian, that is, denominational Christian attacks, on the founding of Cornell University as a non-sectarian institution. The problem is that these attacks are actually rather difficult to identify what exactly they were, and if we scratch the surface, what we see is, in fact, political maneuvering and fighting over federal dollars. [13]

GALILEO'S STRUGGLE

One highlight of the warfare story is the account of "Galileo vs. religion." Most people are aware of the case of Galileo Galilei, scientist, astronomer, and inventor of the telescope. The popular account of Galileo's discoveries centers around a bright young scientist and non-conformist opposed and persecuted by stodgy old church leaders, with science triumphant and destroying all trust in the Bible. Galileo walks into a darkened room surrounded by black-robed clerics to declare that "The earth goes around the sun!" "Heresy! Heresy!" proclaim the church mafia, "This is against the Bible! The heretic does not deserve to live!"

In fact, Galileo believed in God and the truth of the Bible. The scholars that he was at odds with were committed not to the Bible but primarily to Aristotelian science and Ptolemy's model of the universe.

The Galileo case involved warnings and promises: Prominent Roman Cardinal Robert Bellarmino had warned Galileo not to promote Copernicanism as literally true.

The legal case was very specific-it was not about heliocentrism -rather, it was about whether Galileo had violated the terms of his 1616 agreement with Bellarmino...A lenient "plea bargain was reached. But Pope Urban VIII dismissed the bargain and ordered a formal trial; Galileo

was convicted in June 1633 of "vehement suspicion of heresy," and he abjured the earth's motion. [14]

Additional details:

- Galileo was convinced of a heliocentric (sun-centered) solar system based on his astronomical observations.
- Those who opposed him were primarily academics who based their case on Ptolemaic-Aristotelian science (not on the Bible or on observation).
- Galileo had made some enemies by satirizing his opponents in print.
- In the end, Galileo was placed under house arrest.

For an interesting summary of the Galileo affair, along with several other science myths, I recommend Ronald Numbers' book *Galileo Goes to Jail and Other Myths*. [15] Some chapters make science look bad; some parts show failures on the side of the church. Besides the myth that "Galileo Was Imprisoned and Tortured for Advocating Copernicanism," the authors explode these additional stories:

- That the Rise of Christianity Was Responsible for the Demise of Ancient Science
- That the Medieval Christian Church Suppressed the Growth of Science
- That Medieval Christians Taught That the Earth Was Flat
- That the Medieval Church Prohibited Human Dissection
- That the Copernican System Demoted Humans from the Center of the Cosmos
- That Giordano Bruno Was the First Martyr of Modern Science
- That Isaac Newton's Mechanistic Cosmology Eliminated the Need for God
- That the Church Denounced Anesthesia in Childbirth on Biblical Grounds

MODERN (NATURALISTIC) SCIENCE

The early modern scientists (Newton, Brahe, Kepler, and others) saw science as enhancing the worship of God. The Galileo episode advanced the view that church doctrine, with its model of the universe, was opposed to modern science.

It is clear that we understand more about the Universe than the ancients did:

- The earth is a planet hung in space.
- The earth follows an elliptical orbit around our sun (a star).
- Our solar system is part of a specific galaxy (the Milky Way)
- The sun is 93 million miles away.

The result should be a greater awe than ever before. Unfortunately, our understandings seldom lead to awe.

Out of the Enlightenment came the idea that human reason was supreme. If we now understood "how the rains came, how the sun rises, how life works, and how the earth was formed, what place was there for a Creator?" [16]

A number of thinkers who have abandoned Judeo-Christian principles have attempted to find ultimate answers in an understanding of science construed though their materialistic philosophy excluding life's spiritual component. Francis Schaeffer referred to this approach as "modern- modern science."

Schaeffer deliberately distinguished between modern science and modern- modern science in an attempt to emphasize the difference between the two epistemological approaches. Schaeffer stressed that modern science in fact arose amidst a Christian framework. The methodology's earliest practitioners believed that one could understand the operation of the physical universe since it had been imbued with a sense of orderliness by its rational creator.

However, modern- modern science would step beyond the confines of such a paradigm to exclude the role of God by arguing that the universe is a closed system complete in itself. But by eliminating the need for a personal Creator, modern- modern science also eliminates those aspects of man transcending the sum of his material parts or those qualities Schaffer cleverly referred to as "the mannishness of man".

When the cosmos is reduced to mere matter, man can no longer be seen as possessing those qualities that distinguish him from the proverbial furniture of the universe. Instead of arising as responses to metaphysical verities, things such as emotions, thoughts, and acts of creativity are reduced to nothing more than responses to electro-chemical biological stimuli. The aspirations the Declaration of Independence gives rise to become no different than the reaction to the gastrointestinal conditions sparking heartburn and may in fact possibly be interrelated.

The hypothesis of man as little more than an empty bag of mostly water, as the infamous Crystalline Entity put it on one episode of "Star Trek: The Next Generation", does not fit the data or provide much comfort on a cold night when we consider the aspects of existence seeming to rise above the immediacy of our biological functions. Such inadequacy no doubt provokes a response from those not willing to accept how divine revelation fills in these blanks but who realize that the cold scientism of Mr. Spock does not quite cut it either." [17]

What Schaeffer called "modern modern science, was not simply rejecting some supernatural explanations as outside the realm of science but arguing that no divine intervention was even possible since there was no God, no evidence for God, and no need for God even as Creator...

Whereas science is a methodology for understanding the world based on experimental techniques scientism is an ideology which attempts to explain everything scientifically. Scientism holds that "the scientific method is the only valid means for investigating any and all areas of inquiry." Science is the only way of knowing, and only science can determine what is true. [18]

Modern-modern science is accompanied by these positions:

- Pure objectivism
- Scientific naturalism
- Positivism
- Reductionism
- Copernican pessimism

Pure objectivism (a myth)

From the time of Francis Bacon to the early twentieth century, the popular cultural picture of a scientist was as follows: The scientist was a researcher, detached and unemotional, methodically solving scientific problems and making discoveries through cool logic and observation. This person would begin by collecting data by some purely objective manner free of all prejudices and biases (disinterested in the outcome of experiments). There are no prior preferences, no religious or philosophical presuppositions, no subjective constraints. By means of pure induction, the correct generalizations and explanatory principles emerge out of the assembled and organized data: the results are objective, the process empirical. Patiently, facts were added to facts, laying out brick upon brick of knowledge. [19]

This idea of pure objectivism was critiqued by biochemist Michael Polanyi. In fact, suggested Polanyi, a scientist chooses which problems to study, brings all of his or her background to the research, and submits conclusions to the scientific community which receives or dismisses the theories.

Concerning observation, there is now abundant evidence that observation is not a purely passive, objective process; rather, it is an active process which includes subjective elements and in which we very often see what we are looking for, sometimes seeing only what we want to see. Kuyper was incorrect in his assertion that 'the formal process of thought has not been attacked by sin.'' Rather, as Wolters explains, 'fallacies and error (understood as incorrect inferences from the available evidence or from justified premises) manifest the fallenness of human rationality.'' (In fact, there is now a considerable body of research evidence which documents the surprising regularity with which we humans engage in self-serving, illusory, fallacious, and erroneous thinking.) [20]

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Naturalism

For some scientists, Naturalism is a given. Only matter is present, and no mention of a Creator is allowed.

"The prevailing view", says Nancy Pearcey, "is scientific materialism. What is ultimately real is matter-molecules in motion...The materialist creed was captured nicely by the late philosopher Dallas Willard: 'There is one reality, the natural world, and physics is its prophet.'" [21]

Naturalistic thought runs into a brick wall when it tries to explain human consciousness emerging from mere matter.

"We do not know (said philosopher Colin McGinn) how consciousness might have arisen by natural processes from antecedently material things...One is tempted, however reluctantly, to turn to divine assistance...It would take a supernatural magician to extract consciousness from matter." [22]

Naturalism, argues Hanby, is also an inadequate basis for science, since science should begin with metaphysics. [23] Naturalism provides no reason to expect an ordered or intelligible world.

Positivism

Undergirding much of modern-modern science is the philosophical approach of positivism (or logical positivism). Positivism, as expressed by Carnap and Ayer, holds that real statements are either definitions or statements made based on observation or scientific measurement. In the extreme, only scientific statements are meaningful.

Positivists believed that empirical knowledge is the only kind of knowledge worth having (apart from logic and mathematics). The best examples of empirical knowledge are the most successful sciences, above all physics. Positivists also had a political vision—science should displace theology and philosophy as the source of social ideology, and the scientific community should lead and be the model for the rest of society. The idea that society should be based on scientific principles is also sometimes referred to as scientism. Positivism reached its height between the 1830s and the 1960s. Although always hotly debated, it has in the last two centuries been the single most influential account of science and its relationship to society. [24]

Immediately we note that positivism cannot be established by its own description.

Reductionism

In reductionism everything reduces to its parts and only its parts. (We are nothing but biochemicals and cells.) C. S. Lewis called this approach "nothing-buttery."

Sunsets are "nothing but" a turning earth and refracted light. Of course, we're composed of matter (largely water and carbon-based chemicals), but scientism reduces everything to matter and physical laws. Humans are "nothing but" their nerves, bones, organs, and muscle cells. [25]

Science cannot reduce a Monet painting to a prescribed orientation of paint blotches, each of which is defined by a specific absorption spectrum, and science cannot better introduce us to George Washington with a clone from his DNA than history can with his letters and the records of witnesses. [26]

Reductionism is self-destructive. John Polkinghorne said that "Thought is replaced by electrochemical neural events … and the world of rational discourse dissolves into the absurd chatter of firing synapses. Quite frankly that cannot be right and none of us believes it to be so." [27]

Copernican pessimism

Physicist Herman Bondi popularized the idea of the "Copernican Principle." The reasoning goes like this: Not only is the sun the actual center of our solar system, it is only one star among billions. Since the earth is not the center of the universe or even the solar system, then there's nothing at all special about the earth (or human life). "We live on an insignificant planet in an insignificant galaxy."

Astronomer Owen Gingerich expresses the principle this way:

We should not consider ourselves to be on a special planet circling round a special star that has a special place in a special galaxy. With respect to the cosmos we should not be considered special creatures, even though we clearly are with respect to life on earth. In full dress, this is the principle of mediocrity, and Copernicus would have been shocked to find his name associated with it. his is a far cry from the Psalmist's exclamation, 'What is man that thou art mindful of him? For thou hast made him a little lower than the angels. [28]

The opposite of the Copernican position would be the notion of the earth as a "privileged planet," fine-tuned for life and human existence, and ideally suited for observation of the galaxy. (See upcoming chapter on Design.)

SCIENTISM

Many today feel that the world has changed because of science. Religion once gave people answers about their world. They now see these answers replaced by scientific answers. The result: no more awe, no more questions. Many blindly accept that science has explained everything in our world.

The claims of (some) modern scientists line up with the philosophy known as "scientism":

1. Science can explain everything.
2. Science can solve everything.
3. Science has shown that there is no need for God.
4. Science has shown that God does not/cannot intervene in the world.
5. Science has shown that there is no God.
6. Science can give moral direction.
7. Science has made religion obsolete.

Philosopher Alex Rosenberg defines scientism this way:

We'll call the worldview that all us atheists (and even some agnostics) share "scientism." This is the conviction that (1) the methods of science are the only reliable ways to secure knowledge of anything; (2) that science's description of the world is correct in its fundamentals; and (3) that when "complete," what science tells us will not be surprisingly different from what it tells us today. We'll often use the adjective "scientistic" in referring to the approaches, theories, methods, and descriptions of the nature of reality that all the sciences share. Science provides all the significant truths about reality, and knowing such truths is what real understanding is all about. [29]

Roots of Scientism

Although he was definitely a believer in a Creator God, Isaac Newton, unfortunately, opened the door to scientism with his concept of God controlling a mechanistic universe.

A major shift occurred after the Newtonian age: Previously people focused on the Creator and looked for purpose in the actions they observed. Afterward, they focused primarily on cause and effect in the world. In the extreme the universe is a giant machine. [30]

The ideas of Descartes and Bacon moved us further in this direction: [31]

- "Knowledge is power": Scientific knowledge of world enables humankind to build better world
- Scientific knowledge of nature's laws enables humanity to predict how nature will respond
- This gives power to control
- Nature can be manipulated in a quest for a secular paradise
- Need for a new method to get scientific knowledge

A comparison of science and scientism shows us the following:

Science	Scientism
Primarily an approach to studying the universe	Primarily a philosophical position
Can be understood as a gift from God	Science is strictly related to mankind
Primarily a tool	Becomes an idol
Can explain much of the physical universe	Science can explain everything
Scientific discoveries can point us to God	Scientific discoveries prove there is no God

Problems with Scientism

1. Scientism creates a false definition of science.

Science is the study of the physical world (period). Scientism actually has a corrupting influence on contemporary science.

Good science reveals that nature, composed of space, time, matter and energy, had a beginning. Scientism requires a natural explanation for the origin of nature, a logically impossible task. One cannot provide a natural explanation for the origin of nature without assuming the existence of nature in that 'natural' explanation; a circular fallacy. The result is a

variety of arcane string, M-brane, and multiverse theories that have been conflated with science but are now being exposed as fantasy and a threat to the integrity of physics. [32]

2. Scientism is based on positivism.

Scientism is linked to logical positivism (based on the thoughts of August Comte) and analytical philosophy. The outworking of positivism was the verification principle which said that "truth had to be verified empirically (by our senses). Since God could not be verified by the senses, (even) the word 'God' was meaningless. [33]

3. Scientism can't explain origins and can't define itself.

(Durston points out that scientism) is atheism dressed up as science. There are two, major problems.

First, distinguished philosopher of science, Philip Kitcher, argues that the notion of a scientific "theory of everything' 'is an absurd fantasy'. The claim that science is the best and only trustworthy way to discover truth is, itself, not a scientific claim, but a philosophical claim. Thus, scientism is self-refuting from the outset, as the Skeptic's Dictionary and many others have pointed out.

A much more serious consequence of scientism is that it has had a significant, corrupting influence on 21st century science. [34]

4. Scientism leads to objectifying nature and dehumanizing people.

Udo Middelman notes that modern science "reduces man to merely another cause-and-effect phenomenon, not unique or valuable." [35] This type of science then destroys all human qualities, and many people today doubt their very humanness. Further, by applying statistics to generalize whole categories of people humans are reduced to numbers and averages, not unique individuals. [36]

The scientific method, highly appropriate to the laboratory, has become the model for the conduct of most of our business and even leisure activities. This model involves, most basically, the attempt to objectify reality…Rationality and efficiency are typically enhanced if we objectify things rather than personify them. So, businesses and governments deal with people most efficiently as abstract numbers. We modern people easily slip into thinking of our fellow humans as objects, consumers, contributors, numbers to add to our rolls, and so forth. Similarly, we are used to objectifying nature, looking on it as merely something to be used for our technological purposes. [37]

5. Scientism promises a false utopia.

While it is reasonable to expect that science will lead to improvements in products and in health, scientism holds out the promise of unlimited development, economic growth, and human life and health.

6. Scientism ignores the limitations of science.

Steven Weinberg, not a fan of religion, writes-

There are also limitations on the certainty of our explanations. I don't think we'll ever be certain about any of them. Just as there are deep mathematical theorems that show the impossibility of proving that arithmetic is consistent, it seems likely that we will never be able to prove that the most fundamental laws of nature are mathematically consistent. Well, that doesn't worry me, because even if we knew that the laws of nature are mathematically consistent, we still wouldn't be certain that they are true. You give up worrying about certainty when you make that turn in your career that makes you a physicist rather than a mathematician. [38]

Finally, it seems clear that we will never be able to explain our most fundamental scientific principles. (Maybe this is why some people say that science does not provide explanations, but by this reasoning nothing else does either). I think that in the end we will come to a set of simple universal laws of nature, laws that we cannot explain. The only kind of explanation I can imagine (if we are not just going to find a deeper set of laws, which would then just push the question farther back) would be to show that mathematical consistency requires these laws. But this is clearly impossible, because we can already imagine sets of laws of nature that, as far as we can tell, are completely consistent mathematically but that do not describe nature as we observe it. [39]

7. Scientism has no “built-in” morality, in fact it can’t produce moral guidelines.

Science can never explain any moral principle. There seems to be an unbridgeable gulf between "is" questions and "ought" questions. We can perhaps explain why people think they should do things, or why the human race has evolved to feel that certain things should be done and other things should not, but it remains open to us to transcend these biologically based moral rules... The moral postulates that tell us whether we should or should not do so cannot be deduced from our scientific knowledge. [40]

8. Scientism, while elevating reason, can lead to an abandonment of classical rationality.

Among early-twentieth-century thinkers it was perhaps the philosopher Alfred North Whitehead who put the main point against scientism most pithily and memorably: “Scientists animated by the purpose of proving themselves purposeless make an interesting subject for study.” The organized use of reason is a purposeful endeavor entailing thought, conscience, will, language, conceptual standards of truth and validity, and procedures of logic and argument that are themselves nonphysical (“metaphysical”) and undetermined (though not unconditioned or unlimited). That these elementary facts are no longer widely understood in the West is in no conceivable sense intellectual or moral “progress” or the progress of “Enlightenment” and civilization. For so brutal and primitive a mental system as Marxist “scientific socialism” to have attracted so many minds in the West in the last 150 years suggests that the desertion of classical rationality was a catastrophe for the human species. [41]

SCIENCE IS NOT THE ULTIMATE AUTHORITY

It is a mistake to put all of one’s faith in science, since science changes over time with new discoveries.

Some theories in physics were accepted but later proven to be wrong. This is an important (idea), because all too often, science is presented as trafficking in absolute truths. On the contrary, science is a framework for interpreting, systematizing, and predicting nature based on empirical observations. That is to say, a well-accepted 'theory' (framework for understanding/predicting nature) can always be upended with sufficiently compelling contrary evidence. [42]

Examples include

- Phlogiston theory- All combustible materials were thought to contain a substance called phlogiston.
- "Spontaneous generation" – maggots suddenly appearing on decaying meat must be instantly generated or created. This theory was disproven by Louis Pasteur.
- Bloodletting – draining the body of large amounts of blood was believed to heal diseases. (This practice, more than pneumonia it was treating, probably led to the death of George Washington.)
- Aether theory -Aether was held to be the medium through which light propagated, since all known physical entities propagated through a medium. The famous Michelson-Morley experiment did away with aether. [43]
- The concept that crystals are perfectly repeatable in three-dimensions throughout all space. This was disproven by Shechtman with his discovery of "quasicrystals." [44]
- Expanding earth theory. This has been replaced by plate tectonics.
- The "steady-state" universe. Today scientists are convinced that the universe had a beginning and is expanding.

In the 17th Century many of the accepted theories proposed by scientist-philosophers centered around "mechanical philosophy," a concept that all of physics could be explained by mechanical models.

Descartes devised a mechanical model of magnetic attraction in which the Earth and other magnetic bodies emitted streams of little screw-shaped particles, which, when they passed through the pores of any iron object, drew that object towards the magnet….Along the same lines, "In De Corpore [Thomas] Hobbes had presented a mechanical explanation of the production of cold and ice, both of which he attributed to a 'constant wind' that pressed upon bodies." A liquid freezes when this wind "raises the parts of it in such a way that the uppermost parts become pressed together and thus 'coagulated.'" Similarly, Robert Boyle and Robert Hooke explained the relationship they had discovered between the volume of a certain amount of air and the pressure to which it was subjected by "the supposition that air consists of particles like little coiled springs, like wool, which 'consists of many slender and flexible hairs; each of which may indeed, like a little spring, be easily bent and rolled up, but will also, like a spring, be still endeavoring to stretch itself out again'"

Such models seem absurd to us today. But at the time they were put forward, they were generally viewed as the cutting edge of science, replacing the primitive and unscientific explanations of natural phenomena that had been offered by Aristotle and his disciples. [45]

SCIENCE AND IDOLATRY

Thomas Sheahen offers this definition of idolatry: Confusing your own model or image with reality.

By the late 19th century, Classical Mechanics was complete and so good that scientists believed the world was deterministic. Scientists had a very good theory, and believed it represented nature perfectly. That was idolatry: thinking that your model truly represented the underlying reality. Around the turn of the 20th century, nobody thought to call it idolatry, but churchmen who accepted the determinism implicit in Classical Mechanics found themselves backed into a corner trying to defend the notion of free will. It was an awkward time for religion...

There may be a danger of once again believing that a new model represents nature perfectly, as suggested by Hawking and Mlodinow's 2010 book "The Grand Design," where they said the universe created itself. All physicists wish for a "theory of everything," so the temptation toward idolatry will always be there. Forbearance against that temptation is a virtue displayed by those who remember the history of physics. [46]

Scientism is perfect idolatry, focusing totally on the Creation and on human ability, while ruling out any place for the Creator.

The new ideal of science secularized the biblical motive of creation. Creative power was attributed to theoretical thought, which was given the task of methodically demolishing the structures of reality as they are given in the divine order of creation, in order to create them again theoretically according to its own image. [47]

Modern science is committed to the absolutely unrestricted pursuit of scientific knowledge, and the pursuit of knowledge is in reality the pursuit of power...Modern man, through science and technology, has taken increased responsibility for shaping his future. He has really come to believe his own illusion that he is in charge, that he can, through his own rational efforts, become godlike. [48]

Many scholars have convincingly challenged (the) assumptions and conclusions (of scientism). Some have also pointed out the dangers and inherent irony of "hard-nosed scientists" effectively treating science as a religion. For example, in his 2001 book Scientism: Science, Ethics, and Religion, Mikael Stenmark pointed out that statements such as Francis Crick's claim that "we are nothing but packs of neutrons," Carl Sagan's "the Cosmos is all that is or ever was or ever will be," and Richard Dawkins's "every living object's sole reason for living is that of being a machine for propagating DNA" are extra-scientific or philosophical claims. That is, even though these statements were made by brilliant scientists, there is nothing "scientific" about them because they are based on non-testable, non-falsifiable personal convictions. [49]

The contemporary statement of science is given along these lines: “We realize that we are strictly the products of blind irrational forces living on an insignificant planet deep in space, but we have meaning, we can accomplish great things, and eventually we may survive death.” Really? What findings in science led to these conclusions? Isn’t this the ultimate “leap of faith”?

SCIENCE AND MIRACLES

Here's where worldview matters strongly. In a purely naturalistic/materialistic universe, miracles are ruled out by definition, and everything must have a "scientific" explanation. In a theistic universe, on the other hand, God can intervene, temporarily overruling, without undoing, physical laws.

The existence or possibility of miracles has been a controversial area for science since the days of philosopher David Hume (dates). Hume essentially defined a miracle as a violation of natural laws (and therefore impossible if natural laws are fixed and inviolable.)

What about miracles?

The Bible records a number of miraculous events, and scientists need to deal with these somehow. Some reject the Scriptures altogether or at least reject any passages that deal with supernatural events. Some attempt to find a natural explanation for every miracle in Scripture. (The classical stretch is the explanation for Jesus' feeding of the five thousand. When the boy showed his five loaves and two fishes to Jesus every man in the crowd was motivated to dig out a sandwich and share with his neighbor.)

Philosopher David Hume defined a miracle is a violation of natural law. Since natural laws can't be bypassed, miracles would be impossible by definition.

In a few cases the natural cause behind the miracle is included Bible's account:

Exodus 19: A strong east wind separated the waters of the Red Sea for the Israelites to cross on dry land. What makes this a one-of-a-kind occurrence is that it happened just as the Israelites got to the location and lasted long enough for over a million people to cross over. It lasted until right as the chariots of Egypt tried to cross. Timing and context are of critical concern.

At least two incidents have no possible natural explanation: the birth of Christ to virgin girl and the resurrection of Christ after three days dead in a tomb. Certainly, an omnipotent God can do a miracle when He chooses. At the same time, scientists and engineers can still count on physical laws. Physical laws will always control nature except in the rare instance where God's intervenes directly.

Scientific laws do not prescribe what must happen; they describe what has happened. The earth does not go round the sun because Newton's (or Einstein's) law makes it, or tells it to. The earth goes its own way, and the scientific laws are our generalized way of describing how it goes. All that they prescribe are our expectations. [50]

SCIENCE AND MIRACLES

As we consider the present and future position of science, we need to re-examine the nature of "proof" and what present science "knows" or "has proven." Alister McGrath explains:

In its rigorous sense, "proof" applies only to logic and mathematics. We can prove that 2 + 2 = 4, just as we can prove that "the whole is greater than the part." And yet science proceeds by inference, rather than by the deduction so characteristic of mathematical proof.

A series of observations is accumulated, forcing the deeper questions: What must be true if we are to explain what is observed? What "big picture" of reality offers the best fit to what is actually observed? What is the best explanation of these observations? [51]

McGrath goes on to state that science has essentially "proven" that water is H2O and the distance to the moon is known. Facts about our present world are known, but string theory and cosmological models are still in dispute. Happily, buildings will still stand, and circuits will still work even if we are totally wrong about black holes and strings.

Scientists believe that certain things are true today but know that some of them will be shown to be simply wrong or inadequate in the future. Science is a never-ending journey. It hasn't reached its destination yet. It can only report on how things seem at the moment, knowing that they may be seen differently in a generation. [52]

The good news for believers is that some key findings of modern science line up well with a theistic worldview. Recent thinking centers around four "uncanny observations":

- The universe seems fine-tuned for life.
- The universe seems fine-tuned for observation, particularly astronomical.
- The universe seems fine-tuned for technical discovery and development (ordinary and plentiful silicon, the stuff of sand, is the key material for computer circuits).
- The human mind seems fine-tuned to observe and to begin to understand the universe.

Walter Bradley has written, "One of the most surprising developments of the twentieth and early twenty-first centuries has been the discovery of the many remarkable features of our universe and planet that are essential to make it such an ideal habitat for life." [53]

What does it take for life to exist? At least the following: [54]

- Sufficient diversity of elements
- Relative abundance of certain critical elements
- "Molecular machines" capable of processing energy and storing information
- Cellular replication of key molecules (RNA, DNA. Proteins)
- A stable element that can bond readily and also re-bond (Carbon)
- An abundant universal solvent at room temperature (water)
- Long-term energy sources that match with cellular chemistry
- Stable "laws of nature"
- Reasonable temperature range on the planet

A new interpretation- Humankind's ability to comprehend the universe suggests a profound connection between the mind of man and the works of God...How is it that the human mind can do science at all? How can it figure out the world? Why should the laws of nature be comprehensible to humans? [55]

Nobel Laureate Arno Penzias wrote:

I invite you to examine the snapshot provided by half a century's worth of astrophysical data and see what the pieces of the universe actually look like…In order to achieve consistency with our observations we must…assume not only creation of matter and energy out of nothing, but creation of space and time as well. The best data we have are exactly what I would have predicted had I nothing to go on but the five books of Moses, the Psalms, the Bible as a whole. [56]

CONCLUSIONS

While science has produced great advances for our lives it has also been widely misunderstood and treated as if it were somehow in conflict with the Christian faith. This was never the historic position of modern science.

Many today suffer from an intellectual schizophrenia - trying to hold on to two totally contradictory positions between religion/philosophy and science, particularly the idea that humans are cosmic accidents that arose by chance and that we are simultaneously specially created beings with meaning and purpose. This violates the laws of logic and the nature of God and reality.

Some truths (Newton's laws, for example) can only be learned from a study of nature. Some truths (God's grace, for example) can only be learned from special revelation. Knowledge of God's existence comes from both sources. A correct study of nature will reveal to you that there is a God. [57]

Scientism, a philosophical position, winds up being a caricature of true science. If scientism were true-

- Only what is measurable could be investigated.
- There could be no discussion about such abstract concepts as meaning, justice, and love.
- There could be no "why" questions, but only "how" questions. [58] There would ultimately be no place for the humanities.

We might best clarify the place of science by some statements of affirmation and denial:

- We affirm that God initially created all things and set in place the regularities that we call the laws of nature. We deny that the universe or any of its parts "just happened."
- We affirm that God maintains and controls all of nature. We deny that God must supernaturally intervene in every action of nature.
- We affirm that there are areas of nature that are not fully understood at present. We deny that there will never be a natural explanation for many of them.
- We affirm that science is a valuable area of study, especially for believers who see God's creative hand behind nature. We deny that science can explain everything.
- We affirm that science and the Bible describe the same natural world. We deny that the Bible explains all the details of the natural world.

- We affirm that science and the Bible address different concerns. We deny that science and the Bible must be in conflict.
- We affirm that God may intervene in nature as He desires and when He desires (miracles are possible). We deny that God must intervene in any particular situation.

Our colleague, physicist Steve Ball, sums the matter well:

According to several high-profile modern physicists-astronomers, famous for their work in explaining science on a popular level, growth in scientific understanding should lead to a weakening of faith in God. The late Carl Sagan (Cosmos) and his successors in Stephen Hawking (A Brief History of Time), Victor Stenger (God: The Failed Hypothesis), Lawrence Krauss (A Universe from Nothing), and Neil deGrasse Tyson (Death by Black Hole) have all agreed with Steven Weinberg that science offers no support for belief in God. Weinberg, troubled by the persistence of religious faith in the USA, no longer worries about offending religious sensibilities as he once did. He recently expressed his belief that the advance of science is leading to the demise of religious belief, pointing to the trend seen in Europe.

According to science historian Peter Harrison, Christian theologians began to think of nature as another source of revelation to be studied and interpreted, similar to Scripture, only after moving beyond the Augustinian emphasis on the spiritual meaning of both Scripture and nature. This embracing of the literal meaning of both was accompanied by a revived interest in Plato's ideas on how patterns in nature reveal the mind of God. "It was this combination of the meaning and intelligibility of the cosmos which led to the recognition that nature could be regarded as a book."

Bacon recognized the significance of being part of a new era in which he and his contemporaries were surpassing the knowledge of the ancients, and that it could easily lead to arrogance. What preserved his sense of humility was his belief that this new method of discovering truth did not usurp the Bible. Like several of the early founders of modern science, Bacon saw no real conflict between the truth revealed by Scripture and truth revealed by nature. He viewed them both as God's two books of revelation. [59]

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CHAPTER 13: MATHEMATICS

INTRODUCTION

I enjoy this cartoon: Jesus is telling his disciples, "I say, not seven times, but seventy times seven." Peter is groaning and thinking to himself, "Great! Not only do I have to forgive my brother, now I have to do math!" (Forgive—because it's easier than math.)

By way of definition:

Mathematics is the study or science of numbers and quantities, space and measurements, shapes and configurations, using a special set of symbols and operations. In this sense, mathematics is like a unique language.

Subdivisions of mathematics include:

- Arithmetic and algebra-quantitative
- Set theory- Properties of collections of objects
- Geometry (and topology)-spatial
- Analysis, calculus and kinematics- motion

In addition, applied mathematics includes statistics and numerical analysis.
Mathematics is certainly essential to all of science and engineering. It is used for measurement and quantification as well as for modeling and simulation. It is used daily in everyday life. Our sense of time, weather, art, music, economics, and structures are all highly mathematical.

Numbers have become a part of nearly every technology we use today: dashboards, radios, microwaves, phones, clocks, and displays. Medical diagnosis has become increasingly dependent on numerical values within (or outside of) a normal range: blood pressure, temperature, breathing rate, heart rate, weight, blood glucose level, eye pressure, cell counts, oxygen saturation, and body mass index, making design of sensors and easily- read displays a significant area for engineers.

Engineering work is built on a foundation of physical science, which, in turn, is built on a foundation of mathematics. Algebra, trigonometry, calculus, and differential equations are, in effect, the language of engineering, used for problem solving, modeling, and simulation. Statistics, logic, and linear algebra are also valuable for certain applications.

The typical engineering curriculum builds on a foundation in algebra and trigonometry, then introduces calculus, vector calculus, differential equations, and statistics. Derivative calculus is the study of change: slopes of lines, current as change in charge over time, and acceleration

as change in velocity over time.

Many programs include linear algebra (matrix math), numerical analysis, and complex variables. Most engineers have little contact with such theoretical areas as topology, abstract analysis, and non-Euclidean geometry.

Mathematics is key to understanding most engineering principles, many of which are identical in mathematical form across many disciplines:

• Basic algebra- static force summation, sum of currents at node
• Basic linear equations- electricity (Ohm's law), stiffness or spring constant (Hooke's law)
• Basic derivatives -definition of velocity (dx/dt), acceleration (dv/dt), current (dq/dt), and inductance (V = L di/dt)
• First order differential equations- RC decay, mechanical damping, radioactive isotope decay
• Second order differential equation- mechanical resonance, RLC circuits
• Vector calculus- multidimensional statics and dynamics
• Gradient, divergence, curl - electromagnetic fields, fluid flow
• Laplace transforms- circuits, filters
• Fourier transforms- communication theory, vibrations

Students who fail to grasp parts of engineering science often think of mathematics as somehow "magical." ("If I can just grab the right formula and plug in the right numbers, I can solve the problem and make something physical happen.") What they fail to realize is that physical systems can exist and are modeled by mathematics. The process is like the use of Laplace Transforms to solve differential equations. We formulate a physical problem, transform it to the "mathematical domain" for solution, and then transform it back to physical values we can work with.

BRIEF HISTORY

Mankind has always found something fascinating, even mystical, about numbers and mathematical relationships. The ancient Greek followers of Pythagoras (remember ?) believed that natural numbers were the foundation of reality. These early Pythagoreans believed in mystical relationships of numbers and shapes. Reality was primarily mathematical, and numbers were related to wisdom, immunity, and harmony. Somehow in the mathematical patterns lay secrets of the universe.

Plato (428)-347 B.C) thought of "mathematical objects" (particularly numbers) as eternal and unchangeable forms in an ideal world.

The Romans understood the math behind construction, water flow in aqueducts, and the mathematics of the arch.

Augustine of Hippo (354-430 A.D.) "Christianized" much of Greek philosophy, including Plato's view of numbers, positing mathematical objects (and other forms) as ideas in the mind of God. [1]

Ancient Babylonians developed the use of equations while the Greeks developed geometry. The Persian mathematician Muhammed ibn Musa-al-Kharaizimi (780-850) formalized algebra as an independent discipline.

Rene Descartes (1596-1650 A.D.) held that mathematical truth was the most perfect truth.

"The laws of nature," said Galileo, "are written in the language of mathematics."

Galileo argued for five properties of mathematics: "(l) God has written the book of nature-which is the object of natural philosophy-in the language of mathematics. (2) Man can learn this language." (3) Man can "apply it to the study of nature" due to its logical structure. "(4) [H]andled with care, this language cannot err or go astray." (5) This language is "not only the most certain epistemological tool, but" in fact is "the most perfect one capable of elevating the mind to divine knowledge." Hence, knowledge derived by mathematical reasoning possessed the highest certainty possible. [2]

Kepler, Newton, and Leibnitz believed that mathematics could be used to model physical reality.

"The chief aim of all investigations of the external world should be to discover the rational order and harmony which has been imposed on it by God and which He revealed to us in the language of mathematics." (Johannes Kepler) [3]

Newton and Leibnitz developed differential and integral calculus.

Leonhard Euler (1707-1780) integrated the work of Newton and Leibniz in calculus and made large contributions to geometry, topology, and number theory.

Carl Gauss (1777-1855) developed the binomial theorem, studied normal distributions in statistics, unified number theory, and advanced work in series expansions.

Georg Cantor, founder of set theory, developed the theory of infinity in detail.

Certain math concepts were developed long before their application was found. Imaginary numbers were defined by Descartes in 1637. Complex numbers were suggested in 1685 and developed as points in a complex plane by 1799. Much later they were found to be useful in describing circuit impedance, electromagnetic fields, and aspects of signal processing.

George Boole developed Boolean logic in the 1800s, nearly a hundred years before it was applied in digital logic and digital computer circuits.

Until about two hundred years ago, nearly all mathematics was developed to explain physical phenomena. It is only relatively recently in the history of science that totally abstract mathematics has developed and been applied.

The underlying philosophy of mathematics has been debated over the last century. Gottlob Frege and Bernard Russell sought to show that all of mathematics could be reduced to logic. Others held that numbers and mathematical concepts are essentially functions of the mind.

In Principia Mathematica (1910–1913), Russell and Whitehead proved using only logic that 1 + 1 = 2. From here, they hoped to prove every other mathematical fact. By 1920 they thought they were getting close.

David Hilbert (1862–1943) went a step further in the 1920s. Since he considered logic to be a branch of mathematics, he claimed that mathematics was self-dependent. In other words, it did not need to refer to any authority outside itself in order to prove any of its truth claims. This supposedly made mathematics autonomous (its own final authority, independent of all outside authorities), like God Himself. Hilbert's philosophy of math, called Formalism, promoted mathematics as its own foundation and set as its goal absolute knowledge.

Few modern readers realize how influential these thoughts were and are. Math was considered completely knowable. These men believed that someday, every last theorem would be proved and then all math would be proved and known. [4]

CHRISTIAN MATHEMATICIANS

Many of the leading mathematicians were believers and often combined work in math with developments in physics and philosophy. Many of the names are familiar from laws or equations in math or physics.

John Napier (1550-1617)

Napier was a Scottish mathematician, astronomer, and philosopher. His contributions included:

·Development of natural logarithms
·Spherical trigonometry
·Use of the decimal point

As a believer in Christ and the scripture, Napier wrote a commentary on the book of Revelation (using mathematical analysis to predict events in the apocalypse.)

Rene Descartes (1596-1650)

Descartes was a French philosopher, mathematician, and scientist (early work in optics).

Descartes developed:

·Analytical geometry
·Exponential notation
·Infinitesimal calculus

Descartes was a Catholic believer who wrote various proofs of God's existence and

benevolence.

Blaise Pascal (1623-1662)

Pascal was a French mathematician, philosopher, and physicist.

Pascal's contributions included:

·Probability theory –expected values
·Calculus of probabilities

The heart has its reasons, which reason does not know," wrote Pascal. "It is the heart which experiences God, and not reason." Pascal, however, did acknowledge the value of reason in theology. Pascal wrote the Pensees (Thoughts), in which he developed arguments for God's existence, including "Pascal's Wager."

Isaac Newton (1642-1727)

Newton was an English mathematician, physicist, and philosopher.

Newton was a strong believer in God and His creation but developed some unorthodox theology. Newton's mathematical contributions included:

·Calculus of limits (some of the earliest development of calculus)
·Binomial theorem
·Power series

Gottfried Leibniz (1646-1716)

Leibniz was a German mathematician and philosopher. His input to mathematics included:

·Integral calculus for finding the area under a curve
·Formal principles of logic
·Matrix algebra
·Principle of self-similarity

Leibniz was a Lutheran Christian who wrote a reason-based defense of Christianity.

Thomas Bayes (1701-1761)

Bayes was an English mathematician, statistician, and minister. Bayes developed:

·Theory of inverse probability
·Theory of conditional probability (Bayes' theorem)

·Advances in asymptotic series
As a Presbyterian minister, Bayes authored a book on *Divine Benevolence*.

Leonhard Euler (1707-1783)

Euler was a Swiss mathematician, physicist and astronomer whose contributions included:

·Notation for functions of a variable
·Notations for natural logarithms
·Value of pi in pure math
·Graph theory
·Properties of imaginary numbers
·Calculus of variations

Euler was a devout believer in Christ and the divine inspiration of the Bible. He is quoted as saying, "It is therefore a settled truth that Christ is risen from the dead: since this is such a marvel, which could only be performed by God alone, it makes it impossible to cast any doubt on the divine sending of Christ into this world."

Augustin-Louis Cauchy (1789-1857)

Cauchy was a French mathematician and physicist. He contributed to:

·Complex functions
·Number theory
·Calculus of infinitesimals

Cauchy was a staunch Catholic believer who stated: "I am a Christian, that is to say, I believe in the divinity of Jesus Christ."

Charles Babbage (1791-1871)

Babbage was a British mathematician, philosopher, and inventor. Babbage's work was related to:

·Numerical iterations
·Data collection
·Mechanical computation (early computer)

Babbage wrote a defense of divine design and miracles.

William Hamilton (1805-1865)

Hamilton was an Irish mathematician, astronomer, and physicist. He contributed to:

·Vector algebra (cross product and dot product)
·Multidimensional complex numbers
·Polynomial equations

Hamilton was known as a Christian gentleman who saw the hand of God throughout nature.

George Boole (1815-1864)

Boole was an English mathematician and philosopher. His contributions included:

·Linear differential equations
·Residues of rational functions
·Symbolic logic (Boolean algebra, the basis of modern computation)

Boole held various beliefs during his lifetime, a mix of Judaism and Christianity.

George Stokes (1819-1903)

Stokes was a British mathematician and physicist. He contributed to the areas of:

·Vector fields
·Surface integrals
·Asymptotic expansions

Stokes was Vice President of the Bible Society and delivered the Gifford Lectures in 1891 and 1893 on the topic of "Natural Theology," arguing that a materialist universe cannot explain the existence of such natural laws as gravitation.

Bernhard Riemann (1826-1866)

Riemann was a German mathematician who considered his life as serving God as a mathematician. Riemann's ground-breaking work included:

·Differential geometry
·Complex analysis
·Riemann surfaces
·Analytic number theory

Riemann was known as a dedicated follower of Christ. His tombstone quotes Romans 8:28.

John Venn (1834-1923)

Venn was a British mathematician and philosopher who contributed to:

·Statistics
·Symbolic Logic (Venn diagrams)

Venn was a believer who descended form a family of clergymen and served in several churches before becoming a lecturer at Cambridge.

Georg Cantor (1845-1918)

Cantor was a German mathematician whose contributions included:

·Development of set theory
·Advancements in Number theory
·Mathematics of infinity

Cantor was a devout Lutheran believer who held that only God Himself was absolutely infinite, as compared to mathematical concepts of infinity.

NATURE, MATH, AND GOD

Nature is filled with order, symmetry, rhythm, and beauty that can often be described mathematically. Proof of God? Not specifically, but it is but highly consistent with His nature and provides additional data points or pieces of evidence.

1. Basic shapes

Lines, spheres, and ovals appear throughout nature – in trees, sticks, leaves, berries, fruit, and eggs. Basic art lessons usually begin with a recognition and duplication of shapes: the sun as a circle, trees as parallel lines, mountains as triangles, faces as ovals.

2. Symmetry and repeatability

Much of our concept of artistic beauty is tied to the notion of symmetry, a repeated pattern of organization of identical parts. While we commonly think of reflective symmetry, mirrored about an axis, we might also encounter translational, rotational, radial, or spherical symmetry. Artistic symmetry is seen in butterflies, leaves, petals, honeycombs, spider webs, and stars. Symmetry appears in chemical bonding and subatomic crystal structure. Symmetry is such a strong expectation in nature that scientists were led to expect a fourth basic electronic component, now identified as a memristor. [5]

3. The Fibonacci sequences The Fibonacci series is a unique set of integers such that each value in the series is the sum of the two previous values:

{0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55,…}

It is remarkable that many parts of nature involve parts of the Fibonacci sequence:

·Numbers of petals on a flower [3 (lily), 34 (daisy), 5, 8, 21 (other flowers)]

·Spirals of sunflower seeds
·Spiral steps in a pinecone
·Spiral patterns on a pineapple

4. The Golden Ratio

Two numbers satisfy the Golden ratio of their ratio is identical to the ratio of their sum to the larger number: a/b = (a+b)/a

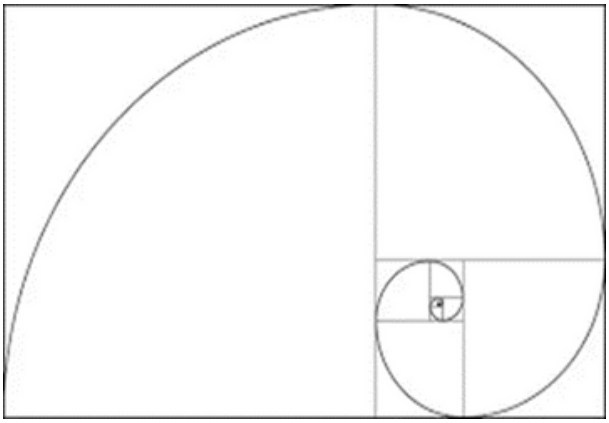
This ratio is the irrational number known as phi, or 1.618...

Once you are past the first eight values, the ratio of two Fibonacci numbers converges to phi.

Use of the Golden ratio produces designs in art and architecture that are pleasant to the eye.

If a rectangle with sides having the Golden ratio is then subdivided and further subdivided an ideal spiral results. This spiral appears various places in nature:

·Nautilus shells
·Spiral galaxies
·Hurricanes



5. Logarithms and human sensation

The logarithm of a number is the exponent to which a base number must be raised to produce the given number. Logarithms allow us to transform multiplication operations into addition and to collapse a huge range of values into a small region.

Physiologists have discovered that our eyes respond to light intensity and our ears respond to sound intensity in a logarithmic manner and that frequencies are spatially mapped logarithmically throughout the auditory system. Snail shells and the cochlea of the inner ear form logarithmic spirals.

2. Fractals

A fractal is a geometric figure each part of which has the characteristics of the whole. Fractal patterns repeat at multiple scales, often in an uncanny manner. Fractal patterns have been

found in:
·Tree branches
·Snowflakes
·Coastlines
·Seashells
·Ferns
·Lightning

The shape of nature

Mathematician Satyan Devadoss has produced a video series he titled The Shape of Nature in which he examines the mathematical forms behind dozens of occurrences in nature, including:

·Chemical bonding
·Protein structure and folding
·Carbon-based fullerenes
·Soap bubbles
·Planetary orbits
·Galaxies
·Wind currents
·Rainfall
·Particle collisions

The secret to understanding how shapes are created and how they work involves two powerful mathematical fields:

·Geometry, the ancient discipline that focuses on quantitative notions such as the length, area, and volume of a particular shape

·Topology, the modern field that focuses on qualitative notions such as connectivity, underlying structures, and the relationships between shapes. [6]

Devadoss focuses on four main categories of shapes: (Knots, Surfaces, Manifolds, and Higher Dimension Shapes) and explores two important and recurring concepts: equivalence and dimension.

There is complexity and simplicity. This is the purpose of mathematics: to record complexity in simple form, to bring order – to establish relationships. Mathematics in brevity can interpret [where] English, even with many words, must flounder. The great laws of the physical universe can be conveyed simply:

Force = mass times acceleration,
Energy = mass times the speed of light squared.
Mathematics reveals God in a precise way no other discipline can. [7]

Note- Any "proof" of God from nature or mathematics is only "proof" of a superior Designer or Mathematician (which are consistent with God) but are not sufficient to identify the Cause as the God of the Bible.

MATH AND CHRISTIAN THINKING

When God created the world was, He thinking in equations and counting galaxies? Probably not, although He knew what humans would eventually call the various concepts and items and knew we would have the joy of discovering the relationships between them. Much of our universe is described mathematically.

A Christian view of mathematics would acknowledge that God intended for math to develop, and that mathematics in some way models reality and ideas set forth by God.

·God created the universe with all of the form and possibility for growth built into it.

·Mathematical concepts appear to be built into the structure of the universe.

·The Bible contains multiple references to numbers, counts, and basic arithmetic.

·Certain numbers are symbolic. Twelve is the number of tribes and apostles. Seven is typically the number for perfection or completion.

·We should avoid looking for coded messages in the Bible. Any book at random can be analyzed by letter sequencing and will probably produce a few words and a few names out of a huge string of letters.

Algebra, geometry, and calculus don't raise theological questions, but logic, chance, and the concept of infinity do produce issues.

Logic

Logic is the discipline where philosophy and mathematics intersect. Some fundamental logic is essential to our thought and language. Logic is key to a reasoned discussion. ("'Come now, let us reason together,' says the Lord." -Isa. 1:18)

A logical argument consists of premises (or hypotheses) and a conclusion. In the context in which such arguments appear, the premises are accepted as true (at least for the sake of the argument). It is the intention of the argument to demonstrate or prove that the conclusion is true, not because of observing additional facts, but solely as a logical consequence of the premises. That is, in a valid argument, accepting the premises forces a reasonable person to also accept the conclusion. A logical argument is valid if its conclusion follows necessarily from the premises. A logical argument is invalid if its conclusion is not necessarily implied by the premises. [8]

A fundamental axiom of logic is that: M AND M/ = 0

Here M is any condition or statement, and M/ is its opposite (complement). M and M/ cannot simultaneously be true. (I can't be here and not here. It can't be Monday and not Monday.)

This fundamental axiom indicates why all religious systems (which have differing views of God,

for example) cannot simultaneously be true.

It is important to consider that logic cannot *establish* truth. If the propositions are true and the structure is valid then the conclusion will be true. There are, in fact, multiple categories of "truth": geometric identities, trigonometric identities, algebraic identities, logical identities, eyewitness testimony,...For many applications of logic with microcontrollers the concept of true means that the necessary condition is met (the switch in ON, the valve is open, the water is flowing, five volts is present,...) The key issue of truth is that of correspondence: Does it correspond to reality?

Symbolic logic

The introduction of special symbols allows us to focus carefully on one dimension of logical relationships. We "strip out" from the meaning of English sentences everything except the truth value, and then we define simple relationships between the truth values of the simple pieces ("Snow is white") and compound sentences. At every point we are implicitly relying on the richness of language, which God has given us, and the richness of our minds, which God has made in his image. [9]

God is logical. He acts logically. His words are absolutely true. The book of Romans contains many examples of reasoned argument, and 1 Corinthians 15 contains a masterpiece of logical truth: "For if the dead are not raised, then (even) Christ is not raised.

And if Christ is not raised, your faith is in vain; you are still (lost) in your sins. Then all those who have fallen asleep in Christ have perished (forever). If we have hope in Christ only in this life, we are the most miserable of all people.

But Christ is certainly risen from the dead, and He has become the first-fruits of those that slept." (I Cor. 15: 16-20).

It is important to say that God is the creator of logic and is not subject to the laws of logic. "Can God make a boulder so big even He can't lift it?" This is hypothetical and nonsense. It isn't a real problem nor consistent with God's actions.

Laws of logic *are contingent on God. They are a reflection of the way God thinks. Thus, they cannot exist without Him any more than your reflection in a mirror can exist without you. Since God is a thinking being and since He has always existed, laws of logic have always reflected His thinking... God has thoughts, and these thoughts are reflected in the way God upholds the universe. As one example, we saw how the law of non-contradiction reflects God's internal consistency: all truth is in God (Colossians 2:3), and God cannot deny himself (2 Timothy 2:13); therefore, all truth cannot be contradictory. The Christian worldview makes sense of the law of non-contradiction. [10]*

Craig writes:

I do believe that just as God is the basis of necessary moral truths, so He is the basis for the laws of logic, like the rules of inference. The laws of logic merely describe the way God thinks. As the supremely rational being, God's thinking is always logical. The rules codify how He thinks...

To say that grounding logic in God is part of a synoptic theistic or Christian view of reality... makes eminently good sense. One thinks of C. S. Lewis' famous aphorism: "I believe in Christianity as I believe that the sun has risen not only because I see it, but because by it I see everything else. [11]

CHANCE AND PROBABILITY

Chance is defined as the occurrence in nature of events without an obvious cause. (This doesn't mean that they are necessarily uncaused.) Probability is the mathematical tool for dealing with chance. We can talk about the probability or "the odds" of a given event occurring.

Chance is also related to uncertainty. We may know an average or expected value of a quantity with a range of uncertainty around it.

The theological issue is this: If chance is real, does that mean that God is not in control, that God is not sovereign?

The real question here is whether uncertainty means that variables can't possibly be known (even by God), or, whether, if we had complete knowledge of all possible factors we could predict all outcomes exactly. If we knew the weight of the coin, the force imparted by the thumb, the physics of the motion, and the atmospheric conditions, we should be able to predict the results of any coin flip. Certainly, there is nothing unknowable to God. "Our limitations set no limits to God's knowledge." [12]

Probability is actually linked to regularity, since we can be certain that in a large number of trials the number of heads will be ½. Why should that be? Poythress suggests that it points to something personal.

Let's take (an example of regularity) a very simple one, that the heads will come up half the time. Well, that's already a statement about regularity. It's a general statement, and it's rational, and it's language-like. And those two features, rationality and language-likeness, are characteristic only of persons. What I think people often don't recognize is they think of the world -- because of the influence of materialistic philosophy -- they think of the world as matter in motion. Or even if they're dealing with human society -- it's regularities that have no further explanation other than they're just there.

But if you look at the character of what we expect the regularities to be, we expect them to be always the case. That's the feature of eternality: everywhere the case. That's the feature of everywhere present. It's characteristics of God. And everybody relies on that... So, everybody relies on that, and it's actually revelatory of God. It's divine nature. It's divine -- it's characteristics of God that are being revealed there that people are relying on. [13]

It is important to state that "chance" is strictly a mathematical description. We must not try to personalize chance or to suggest that chance can actually cause anything.

The word chance first gets associated with events that we as humans cannot predict or explain. The word chance acts like an empty word to label our ignorance. We are saying that

we do not know the causes, and we do not know the reasons that would explain how and why an event came about. Our ability to explain fails us. So far, this situation corresponds to Merriam-Webster's first meaning, "something that happens unpredictably."

Then, in a second step, we convert this empty word chance into the word Chance with a capital C. The empty word suddenly becomes a label that we offer as the new explanation for the unpredictable event. But this new "explanation" has no real content. We just have a word to label what we do not know. We say, "Chance brought it about," but the word Chance translates into saying, "What we do not know brought it about." If Chance is a kind of god, it is a classic case of an unknown and unknowable god. It expresses a non-Christian view of transcendence. [14]

Statistics allows us to handle data containing uncertainty and to compute numbers and make predictions based on that data. It may seem remarkable that there should be a regularity amidst the randomness.

In all these cases, our reasoning has relied on coherence between numbers on the one hand and events in the world on the other. And the events in the world are unpredictable. It is all the more remarkable that there are nevertheless stable coherences between these events and the stabilities in numbers. God has ordained both. And he has ordained them in relation to each other. He has ordained harmony. As usual, the harmony reflects the inner harmony of his own nature. The Father loves the Son, and he causes this original harmony to be reflected in the world. In particular, his faithfulness, creativity, and wisdom are reflected in the patterns involving chance events. The glory of God is displayed in the glories in probability. [15]

Note: If a very low probability event occurs- God may be trying to tell you something.

INFINITY

The concept of infinity was developed in detail by Georg Cantor in the late 1800's. The notion itself yields puzzles and seeming contradictions: The set of all positive integers is an infinite set. It can go on forever. There simply is no "biggest number." The set of all possible numbers (including positive integers, negative integers, irrational numbers, imaginary and complex numbers) is also an infinite set but must be a larger set (a larger infinity?) than the set of integers.

Cantor received harsh criticism from various religious leaders who insisted that God alone is infinite. They failed to distinguish between God's eternal properties and the mathematical concept of numerically extreme, or largest possible value. Cantor himself wrote:

The fear of infinity is a form of myopia that destroys the possibility of seeing the actual infinite, even though it in its slightest form has created and sustains us, and in its secondary transfinite forms occurs all around us and even inhabits our minds... I am so in favor of the actual infinite that instead of admitting that Nature abhors it, as commonly said, I hold that Nature makes frequent use of it everywhere, in order to show more effectively the perfections of its Author. [16]

THEOLOGY OF MATHEMATICS

Mathematics points to an orderly universe, which suggests intelligent ordering. The repeatability of mathematics ties to God's faithfulness in upholding all things and keeping every promise made to mankind.

We believe that all truth (including mathematical truths) exists in the mind of God, and therefore learning mathematics is, in the words of St. Augustine, "thinking God's thoughts after Him." We believe that...

... mathematical truths reflect the nature of God.

...mathematics describes the order, symmetry, and beauty of God's creation.

...mathematical thinking is one way in which humans demonstrate the image of God.

...mathematics is a necessary and useful tool for humans to obey God's commands to:

·exercise stewardship over God's creation.

·love their neighbor.

·fulfill the great commission.[17]

A Christian perspective on mathematics would include these propositions [18]

1.We would acknowledge the contributions mathematics has made to developing and understanding natural science.

2.Mathematics involves rational operations, yet mathematics is beyond human rational construction.

3.The order, symmetry, and beauty of mathematics is built into the universe from Creation.

4.Mathematics is a good gift from God for understanding quantitative aspects of our world." [19]

5.We should reject aspects of our world "that arise from the absolutization of mathematics." [20]

Vernon Poythress, a mathematician and theologian, describes the interaction between God, man, and mathematics: [21]

1."God says what shall be true for His creation (Eph. 1:11, Lam.3:37-38), and mathematical truth is part of that truth."

2.God is the originator of mathematical truth, while man is only a recipient.

3.God infuses life into the Creation, as He does into the church. (Col. 1:17-18)

4.Like all of Creation, mathematics is upheld by, and "coheres" in Christ. (Heb. 1:13) (Mathematics can be related to logic, physics, language, and mental constructs.)

5.Mathematics will serve God's glory. (Col. 1:16)

6.All Creation, including mathematical truth, reveals God. (Rom. 1:20)

7.Simple arithmetic (two apples plus two apples) involves such concepts as quantity, counting, sequence of events, and constancy of physical objects.

8."Man's mind, logic, and external reality (amazingly) cohere."

IS GOD THE GREAT MATHEMATICIAN?

Hartzler has pondered the question of God as "The Great Mathematician":

I feel that even the thoughts of mathematicians have their ultimate source in God. However, to say, as some have said, "that the Great Architect of the Universe now begins to appear as a pure mathematician," appears to me to belittle the idea of God. The pure mathematician is just a puny little man with a quite finite mind doing a small bit of purely human reasoning. If some of this reasoning does seem to aid us in delving into the mysteries of God's creation, we should give more glory to His name for allowing us this privilege. But to put the infinite God, creator and sustainer of the universe, as well as savior of our souls, into this category seems to me to be quite a serious blunder. May we then, as Christian men of science, make more use of the mathematical method in science, since it has proved so fruitful in leading us into a deeper understanding of God's creation. [22]

MATHEMATICS AND THE TRINITY

One of the most puzzling pieces of Christian theology is the Trinity, largely because we try to work through it mathematically. If the Father is God and Jesus is God and the Holy Spirit is God, are there actually three Gods? Absolutely not, according to Scripture (Deut. 6:4, Isa. 43:10, Isa. 4:6).

God the father, God the Son, and God the Holy Spirit each have personal attributes, and each interact with each other, so there are, in fact, three divine Persons. While their roles differ, they are totally united in purpose and character and one in every action (one Creation, one Covenant, one Salvation, one future). We might think of "God" as a single category, yet the set contains Father, Son, and Spirit.

There is a case in mathematics in which 1+1+1=1, and that is the case when each quantity or set is infinite. Infinity plus infinity is still infinity, as is infinity plus infinity plus infinity. Since we are dealing with infinite Persons this approach may make the most sense to our (finite) minds.

Because God contains both unity and plurality in Himself, there is no need for us, in the

Christian framework, to resort to the futile attempts of reductionism ... As a matter of fact, the reductionisms... can be seen as a kind of mathematical version of an old heresy: gnosticism. Why should we say that? Well, in exploring mathematics one is exploring the nature of God's rule over the universe, i.e., one is exploring the nature of God Himself. A reductionism thus ultimately amounts to an attempt to derive some aspects1 of God's nature from other aspects2, an attempt to say that the latter aspects2 of God's nature are more fundamental. The aspects2, are then somehow what is "really there," as opposed to the only apparent existence of aspects1. I classify this as a gnostic-type heresy, because gnosticism develops a theory of emanations whereby certain inferior deities derive their being from emanations of the ultimate Deity. This gnostic derivation of being is not so dissimilar to the present-day derivation of aspects. [23]

God Himself has a numerical nature. He is three in one. It is interesting that Jesus uses the plural pronoun"we" (John 17:21; cf. John 14:23) and plural "are" (esmen, John 10:30) in speaking of the Father and the Son. Mathematics (c) is eternal because the Father, Son, and Holy Spirit (3!) are eternal (John 1:1; 17:5; Heb. 9:14). And God's eternal numerical nature is manifested in creation much as His love, wisdom, and justice are manifested.

Following the "pattern" of His own plurality, He creates the world as a plurality: "0 Lord, how manifold [Heb., many] are thy works! In wisdom hast thou made them all; the earth is full of thy creatures" (Ps. 104:24). This verse traces back the plural nature of God's works to His wisdom. And, in the final analysis, the wisdom of God finds embodiment in Jesus Christ, "in whom are hid all the treasures of wisdom and knowledge'(Col. 2:3), "whom God made our wisdom, our righteousness and sanctification and redemption" (I Cor. 1:30).

We should also observe that the Biblical view solves, in a clear-cut fashion, the problem of the meaning of '2 + 2 = 4' in relation to other truths (§16). '2 + 2 = 4' finds its ultimate meaning and integration in the unchangeable fullness of the Divine Trinitarian Fellowship. Because God is unchangeable, the truth of '2 + 2 = 4' is not altered by the next human discovery.

Created analogies inevitably break down, because they are only finite images of the Infinite One. In the case of God's numerical nature, this is obvious. God is Three Persons, yet at the same time One God. Jesus can say, "I and the Father are one" (John 10:30). No created thing is three and at the same time one in the same sublime way. [24]

GODEL'S BOMBSHELL

In 1932 mathematician Kurt Godel dealt a “fatal blow” to formal mathematics. In what has been termed the “Incompleteness Theorem” he showed that it is impossible to prove all statements within a formal mathematics, a goal that had been stated by David Hilbert two years earlier: “The theory of proof...is capable of providing a solid basis for the foundations of mathematics.” [25]

Godel’s conclusion was that “The completeness of any mathematical system cannot be established by principles of logic.” There will always exist some true statement that could never be logically proven.

Basically, what Gödel's First Incompleteness Theorem did was to show that all mathematical systems are incomplete because they are unable to encompass every possible truth. In other words, some things exist that we absolutely know to be true but cannot prove through the use of any mathematical system. (Given the complexity of Gödel's arguments, readers must simply take his conclusions to be correct.) "Put more prosaically, there is an eternally unbridgeable gap between what can be proved and what's true"... Therefore, Gödel's First Incompleteness Theorem proved mathematically that mathematics would never allow us to apprehend all possible truths. All mathematical systems are thus incomplete. [26]

Nickel summarizes the impact of Godel:
Hilbert's goal is unattainable; a shattering realization to many mathematicians. Man's reason is not autonomous; man is not omniscient. To the biblical Christian, Godel's results confirmed the truth that Scripture had always proclaimed. Autonomy alone belongs to the biblical God. Whenever man tries to construct any system of thought without reference to this God, it will ultimately fall short. [27]

MATHEMATICAL MODELLING

When a system is sufficiently complex or when we need to optimize or control a system engineers often rely on a mathematical model. Our results will depend on how well the abstraction fits with the real system.

What is mathematical modeling? It is using mathematics to understand some aspect of a nonmathematical entity. For illustrative purposes we will refer to the non-mathematical entities as things in the "physical world." The term "physical world" should not be limited to the world of atoms. For our purposes, it also includes other nonmathematical entities, such as social phenomena. The "mathematical world" is where mathematical results are derived. Rather than get bogged down in what or where these worlds are, we will assume an intuitive understanding of what is meant by "mathematical world" and "physical world."...

Christians are called by the Bible to care for and develop creation. This means that we need to understand the world around us. One way to do this is to formulate mathematical models. Thus, a Christian approach to mathematical modeling is to understand the limitations of mathematical models and the modeling process. Also, when applying results, we should act in humility, realizing that we are responding to human knowledge gained from human observations and human reasoning. If mathematical models give results that don't correspond with observations, then we should recognize the failings and adapt, not necessarily letting the current models or thinking rule our responses. This is not an exclusive response, limited to Christians. When mathematical models do correspond with observations or reveal previously unknown structure, the Christian should give glory to God and respond in a manner that is believed to honor God further and care for His creation. [28]

THE UNREASONABLE EFFECTIVENESS OF MATHEMATICS

Calvin Clawson has pondered:

Why does mathematics work in the material universe? ... Why does mathematics work so magnificently as a model to explain our universe?... Why should this relationship between model and physical reality exist unless there is some underlying connection? If numbers are only objects of thought, then why are they so wonderfully useful in analyzing the material universe? [29]

Morris Kline adds:

But where and what are the physical agents that produce the effects mathematics describes? ... There are no answers ... Why does mathematics work? We are faced with a mystery ... The study of mathematics and its contributions to the sciences exposes a deep question. Mathematics is man-made. Yet with this product of his fallible mind man has surveyed spaces too vast for his imagination to encompass, he has predicted and shown how to control radio waves which none of our senses can perceive, and he has discovered particles too small to be seen with the most powerful microscope. Cold symbols and formulas completely at the disposition of man have enabled him to secure a portentous grip on the universe. Some explanation of this marvelous power is called for." [30]

In 1960 Nobel-prize winning physicist Eugene Wigner published a remarkable paper entitled "The Unreasonable Effectiveness of Mathematics in the Natural Sciences," in *Communications in Pure and Applied Mathematics*, vol. 13, No. I (February 1960). In it he pondered the ability of mathematics to model all of nature, focusing primarily on

·Falling bodies and gravitation
·Newton's laws
·Planetary motion
·Quantum mechanics

The last example is that of quantum electrodynamics, or the theory of the Lamb shift. Whereas Newton's theory of gravitation still had obvious connections with experience, experience entered the formulation of matrix mechanics only in the refined or sublimated form of Heisenberg's prescriptions. The quantum theory of the Lamb shift, as conceived by Bethe and established by Schwinger, is a purely mathematical theory and the only direct contribution of experiment was to show the existence of a measurable effect. The agreement with calculation is better than one part in a thousand. [31]

The result, Wigner claimed, was beyond reasonable explanation. He dropped it at that point, but left it open to readers to postulate an answer beyond the material world.

Let me end on a more cheerful note. The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve. We should be grateful for it and hope that it will remain valid in future research and that it will extend, for better or for worse, to our pleasure, even though perhaps also to our bafflement, to wide branches of learning. [32]

Twenty years after Wigner's paper, mathematician and computer scientist Richard Hamming published "The Unreasonable Effectiveness of Mathematics." [33] Hamming discusses several examples of the power of mathematics in explaining physical phenomena. "Complex numbers, for example, originated as an abstract extension to the real numbers, intended to enable

mathematicians to solve polynomial equations. They have turned out to be incredibly useful, however, in the study of many areas, including fluid flow, steady state temperature, and electrostatics." [34]

Hamming suggested that, possibly, "we see what we look for." Scientists are accustomed to look at problems from a mathematical point of view. "We select the kind of mathematics to use." [35] Perhaps scientists unconsciously "rig" the system by selecting ahead what form of mathematics might best fit the situation. In the end, Hamming, like Wigner, also concludes that he is unable to explain the effectiveness that he sees.

From all of this I am forced to conclude that mathematics is unreasonably effective and that all of the explanations I have given when added together are simply not enough to explain what I set out to account for…I think that we…must continue to try to explain why the logical side of science–meaning mathematics, mainly–is the proper tool for exploring the universe as we perceive it at present. [36]

John Polkinghorne concludes:

There is no a priori reason why beautiful equations should prove to be the clue to understanding nature; why fundamental physics should be possible; why our minds should have such ready access to the deep structures of the universe. It is a contingent fact that this is true of us and our world, but it does not seem sufficient simply to regard it as a happy accident. Surely it is a significant insight into the nature of reality. [37]

The human passion for mathematics goes beyond the desire to predict events and to control our environment. We seek to understand the universe, to see how it all fits together. We seem hard-wired to seek deep, profound patterns that connect the wild variety of things in our world. Again, isn't it a little too convenient that we have an appetite for wonder a yearning for understanding and a brain that is capable of achieving both? [38]

The ability of mathematical expressions to represent physical reality is consistent with a Designer- Creator. Since most early scientists worked within a Christian worldview, "they believed that a reasonable God had created an intelligible universe and that part of that intelligibility consists in being open to mathematical formulation." [39]

"The amazing fit of mathematical concepts to the physical world cries out for an explanation- but without the assumption of divine creation by a reasonable God, there is no explanation." [40]

CONCLUSIONS

The modern theory of mathematics is that mathematics is purely an invention of the human mind, invented and not discovered. However, the models we make in our minds have corresponded to real patterns in the physical world. Jongsma [41] suggest that there are two understandings of mathematics

·What we actually study- the relationships and shapes in God's created world

·The symbols, concepts, and equations developed by man to describe the mathematical realities we observe

The patterns and relationships of nature and physical laws have been present since Creation, placed in our world by God Himself. Humans have recognized them and discovered the laws. The symbols, categories, and equations are man-made. Mathematics, then, he concludes, "is both discovered and invented, though we may still argue about which is which." [42]

God is the Creator of the physical world, a concrete and objective world that stands outside of man and a world that reflects mathematical patterns, and the human mind, a mind that can think mathematics in the abstract. This one sentence explains why mathematics works, a truism that is a mystery to a host of philosophers, scientists, and mathematics. One of the greatest scientists of the 20th century, Albert Einstein (1879-1955), reflected on this conundrum, "The eternal mystery of the world is its comprehensibility."[43]

Hartzler considers the goodness of our mental approach to math to physical reality:

We have emphasized the fact that pure mathematics is an invention of the human mind. The more nearly that the elements and the postulates of the subject correspond with what we consider as physical realities, the more closely will the results correspond and can be used to predict the manner in which physical phenomena will perform. Hence... mathematics becomes the handmaiden or servant of the sciences. But just to say that something has been proved mathematically, does not insure that the results will correspond with physical phenomena. For example, it was proved a number of years ago that it was impossible for a heavier-than-air craft to fly through the air. This is no discredit to mathematics, but rather it serves to warn us that we need to be very careful in the applications of mathematics. Since all sciences are continually making more and more use of mathematical methods, we need to keep constantly on our guard that the results obtained correspond as closely as possible with physical phenomena. [44]

Mathematics, rightly understood, should move us towards thinking about God, and even to worship.

In Miracles, Lewis uses mathematics in his arguments for the existence of the Supernatural by introducing the concept of Reason, which leads to the laws of thought, logic, and the idea of proof. In regards to Nature, mathematics is seen as the language by which the knowledge of Nature is communicated (pure mathematics) and also the means by which humans alter that Nature (applied mathematics). Finally, when considering the impact of new knowledge, Lewis suggests that the fundamental tenets of the Christian Faith are like the simple rules of mathematics - both are static. [45]

Wilson suggests that contemplating natural laws and their mathematical order in everyday life points him to the Creator:

Thinking about math helps me have another sense in which He's there. It's like there's these divine fingerprints on the world. And so even just looking around the room with the technologies here, I'm thinking about the natural law that's there in order for all these things to be working out with the microphones and the sound waves and all this kind of stuff.

And if I think about … some more abstract mathematics, (like the) the quadratic equation, or any mathematical model that we might put together, a spreadsheet that a person might be using at work and calculating numbers off of that, that has a profound order. And when you do that, you're going to get a certain result. And that result teaches you something about the world. And God made the world that way. It could have been a different way, but it's not. And so that again, points to a designer in my mind. And so I just keep seeing that design lurking in the background. [46]

McCarty marvels at the beauty and patterns in mathematics:

Math allows people to see God's beauty in a way nothing else could ever do. We can see God's design in the beauty of a succinct mathematical proof and in an equation that nicely describes a phenomenon of nature. For example, the derivative of velocity is acceleration, and Bayes' Theorem allows us to calculate useful probabilities that describe the world… Studying math even makes us aware of God's creation in new ways. As Stewart says, "It opens my eyes to nature's laws and patterns. It offers an entirely new experience of beauty…The rainbow is just one example…When I look at a crystal, I am aware of the beauties of its atomic lattice as well as the charm of its colors…Then there's the inner beauty of mathematics, which should not be underrated. Math done 'for its own sake' can be exquisitely beautiful and elegant." [47]

God is the creator of all things mathematical, but mathematics itself is not divine, eternal, or independent. It is part of the created reality subject to God. God is in no sense dependent on the mathematics of the universe. God is not simply the "Great Mathematician." Such thinking actually demeans Him. He is Creator and Lord of all.

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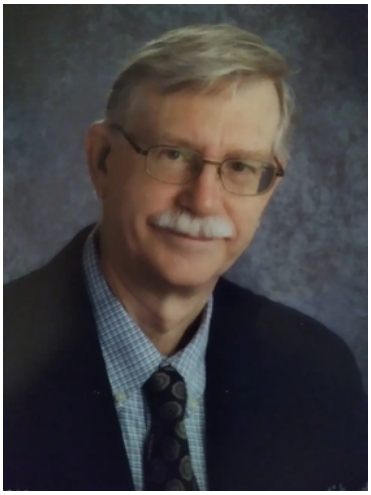

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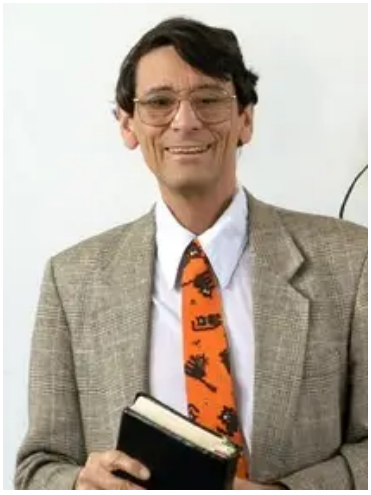

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