Commencement

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Faith and Learning Statement

Prologue

Each May, Calvin College engineering seniors (in teams of 3–5) display prototypes of engineering designs from their year-long capstone "Senior Design" course. The open-to-the-public exhibition is followed by technical presentations and a large banquet with family and friends. The banquet provides the rhetorical setting for this faith and learning statement. My comments to the students in this hypothetical commencement-style speech communicate my views on the engineering profession, its place in the Christian liberal arts context at Calvin, and engineers' relationship to their Creator.

Good evening ladies and gentlemen:

I own a sledgehammer. It's small: a five-pound sledge. I brought it with me tonight, as you can see.[1] I also own a circular saw.[2] As you know, these tools can be extremely useful. For example, I removed an ugly interior brick wall in my previous home with this sledgehammer. And the saw can be used to construct housing for those without.

But tonight I want us to consider a different use for my tools. What if, last night, I went completely berserk and used these tools to … demolish your projects? The very night before the

[1] Hold sledgehammer for all to see.
[2] Hold close to microphone for maximum effect!

public demonstrations of your prototypes. For some of the electronics projects, I could bring about complete carnage with a single swift strike of the hammer or slice of the spinning blade. In other cases, hard work may be required for my hypothetical behavior to have its intended effect. Tonight, I want to consider with you less the resulting pile of wires and parts and more the implications of your reaction to my demolition. As we do, we'll reinforce old, and maybe learn some new, ideas about the engineering profession; the grand narrative of creation, fall, and redemption; and the nature of God.

Creation and Engineering

Perhaps some of you would be happy to see your project in ruins. But, I suspect only a fraction of you is in that camp. Instead, I venture that most, if not all, of you would be devastated by my actions. You might ask "how could you *do* this to the very work of my hands?" "I worked so long and hard on this and now it's destroyed!" "Now what's left to show my family and friends who traveled hundreds of miles to see the results of thousands of tuition dollars?"

The root of your despair would be a very appropriate pride in all you have accomplished in this Senior Design year. That's not to mention the previous three years (or four years, or … whatever the case may be). Because you are so pleased with the results of your efforts, you would grieve the heap of parts that my hammer and saw produce.

You take pride in your prototype, and you should be able to say that, at some level, "it is good," referring, of course, to your *pre*–moment-of-Heun's-insanity prototype. Maybe your prototype is not *perfect*, but your prototype *is* good. At our best, we engineers create really cool and useful things that meet real-world needs by conceiving with our minds and hands and then testing and fabricating for service in the real world. Your work in the capstone course provided this exciting experience for you.

Maybe this is the first time that you completely dedicated yourself to a project like this. Or, perhaps you had a similar experience in a previous class: an assignment that became a responsibility. (If you were in my ENGR 382 instrumentation lab class, you know the feeling of "wanting to make your instrumentation project *work*" before the end of the semester: not because of the grade but because you couldn't bear the thought of it not working.) In some sense, you *spent* yourself, exhausted yourself, on your project with long days and, often, even longer nights! And, there is a sense in which a part of yourself remains in the thing that you and your teammates created. In fact, no one else would have designed it exactly the same way you did. My destroying your prototype or model destroys part of you. You created it, and now it is lost. You may feel disappointment, frustration, or grief.

To say "it is good" about your prototype is similar to God's reaction to God's creation. "God saw everything that he had made, and indeed, it was very good. And there was evening and there was morning, the sixth day."[3] Cornelius Plantinga, in his book *Engaging God's World* describes God's creative acts.

> Creation was a way for God to *spend* himself… In creation God graciously made room in the universe for other kinds of beings, … generating ten to one hundred billion galaxies, each galaxy a stupendous bonfire of as many as one hundred billion stars, and many of the stars loaded with their own orbital systems. Over some suitable length of time, God generated great galactic wealth, and he is still generating it inside certain nebulae that are, in effect, nurseries for young stars. On our own planet, God used processes of his own imagination to make salamanders and sandhill cranes and fringed gentians. Warming to the task, God made more than 750,000 species of insects and 250,000 species of plants. God made grasshoppers that look like leaves and beetles that hitchhike on the backs of bees. [4] [Italics mine.]

In Spring 2004, I gave a presentation to Calvin's Alumni Board about the engineering program. I was waiting in the hall for my time to speak when Chaplain Cooper happened to stroll past. He noted my coat and tie and said, "Looks like you're preaching today, Matt. What are you

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[3] Genesis 1:31
[4] Plantinga, Cornelius Jr. *Engaging God's World*. Eerdmans, 2002, p. 22-3.

preaching about?" His question was a meant to be a joke, but it got to the heart of the matter. I replied, "The Creation. I'm preaching about God's creation today!"

In fact, we engineering faculty preach about the Creation each time we enter the classroom. Together, we professors and students study and learn as we gather around what we sometimes call "general revelation." If you took my ENGR 333 thermal design course, you might recall a lecture where we evaluate the details of optimum heat exchanger design to minimize exergy[5] destruction. We learn that if the tubes are too small, exergy destruction due to pressure drop is detrimental. On the other hand, if the tubes are too big, exergy destruction due to heat transfer degrades performance. Together we stand back and marvel at humankind's ability to develop and formulate abstract concepts such as exergy, pressure drop, and heat transfer.[6] And, we identify this particular engineering design issue as yet another example of the way such engineering tradeoffs are observable in the creation. It is as if God literally challenges us to come to grips with what God and humans have created and to do our designing well, being cognizant of the tradeoffs that we find. We professors attempt to convey some of the excitement of this challenge as we explore the Creation together.

I hope that you always retain a certain awe about God's astounding creation. On one evening in 1993 I was dumbstruck by a fantastic display of millions of stars on a crystal clear night in the interior of South Africa where light pollution cannot hide the Milky Way. Maybe you're awed by the incredible animal diversity everywhere humans haven't destroyed it. Or by creatures too small to be seen by the naked eye. Whatever your awe, never lose it!

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[5] A simple definition of "exergy" is "work potential."

[6] In itself, the development and formulation of abstract concepts such as heat transfer, pressure drop, and exergy is a creative act, one in which humans, again, reflect the glory of their Creator.

God *spent* God's self on creation, and you *spent* yourself on your creation, your capstone project. Of course, God creates *ex nihilo*, but we create from what we find around us.[7] Nonetheless, the book of Job tells us that God celebrates the creation and enjoys it: you can also celebrate and enjoy your creations.[8]

On the sixth day of Creation, "God said, 'Let us make humankind in our image, according to our likeness…'"[9] I submit that the pride you feel about your Senior Design project and the celebration we're having tonight is rooted in our image-bearing nature. In fact, because you are fashioned in God's image you will create, and you will be justifiably satisfied with your designs, just as God's creation was "good" and God celebrated it. Your creative work in Senior Design and in all your future engineering endeavors will be one way (not the only way, to be sure) that you reflect God's image in your lifetime. God's original creation was perfect and good in every way, and our creations are, of course, imperfect and finite. We are not God, but we do create things. And those creative acts are ways that engineers *reflect* God's image. If you haven't considered it before, you now know why you did so many "design problems" and "design projects" here at Calvin. I like to tell Fridays at Calvin visitors that "Calvin did design before design was cool." We do design here because doing engineering design provides a significant link to our Creator.

If it is true that engineers reflect God's image, we ought to be able to discern something about that which is reflected in us. In fact, because our work is so intimately related to creating, we engineers may be well suited to consider some elements of this issue. The excitement that you feel tonight can lead you to consider God's celebration of God's creation. And, your reaction

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[7] I choose to use the word "create" to describe what humans do. Others choose the words "sub-create" or "co-create."
[8] Job 38–41
[9] Genesis 1:27

to my destruction of your senior design project can lead you to consider God's reaction when elements of God's good and perfect creation are damaged. Perhaps you can glimpse God's grief when God's creation is exploited or pillaged.

The Fall and Human Finitude

Tragically, however, human creative activities within the engineering enterprise can go horribly wrong! Indeed, as we all know, the original good creation has been corrupted and distorted. Mismanagement, poor ethical decisions, and misplaced motivations are examples of the effects of the corrupting effects of sin on engineering projects. As you move forward from this night, every project you work on will be tainted by the Fall.[10] You should work personally to oppose the effects of the Fall in your engineering work and designs. Perhaps you can steer your team toward honesty, exposing the selfish motivations for a design directive when questioned by a superior. Perhaps you can identify the values embedded in a design and sensitize others on your team to how those assumptions might unintentionally marginalize potential users. Perhaps you can be the one member of your team who insightfully questions the methods used to obtain skewed market data that furthers your company's political agenda. Your Senior Design year provides an excellent first experience for your future endeavors within the engineering enterprise. I encourage you to utilize your rich moral and ethical foundations, some of which you learned from your parents, at Calvin College, and other places, to be responsible and insightful critics in your future professional environments.

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[10] The effects of the Fall can be observed on both individual and structural levels. An example of the effects of the Fall on an individual level within an engineering project would be an engineer falsifying safety test data to obtain permission to market an unsafe product. An example of the effects of the Fall on a structural level within the engineering enterprise would be the need for the home security alarm system industry. Disordered relationships among people lead to burglaries and homeonwners' feelings of insecurity. An entire industry arises to address this disordering effect of the Fall. The need for the industry in the first place arises from the Fall. Clearly, engineers can work with integrity on redemptive home security system project development within that industry. But, the home security alarm industry (like all other industries) embodies aspects of the Fall within itself.

Then, there are times when things go horribly wrong with our engineering creations despite the best intentions of every engineer working on a project: a consequence was not considered, a sequence of events was not envisioned, or an extreme operating condition was not evaluated. Consider this: civil engineers will talk about a 100-year flood and design bridges and buildings to withstand high water levels. What about a 1000-year flood? Do flood level measurements actually exist to describe it? If no data exists, how can you design for such an event? Failures to correctly envision the future expose not sin but human finitude. We can never envision the full range of conditions and events that our created stuff will encounter. But, by God's sustaining grace, a successful design anticipates *most* of the future conditions and *usually* functions well in real-world service. In fact, you could say that engineers need to be prophetic, to predict the future, during the design process.[11] Engineers must envision the future performance of a device and design it to achieve those behaviors. So, in a way, engineers prophesy through their designing. But, humans are finite, so we prophesy imperfectly and designs fail, often spectacularly. Tonight I challenge you to be prophetic in your designing. And, be careful not to confuse sin and finitude. Attempt to root out sin and be aware of your own finitude when you design.

Redemption and Responsibility

Another prophet, Isaiah, begins his description of the coming kingdom, the redeemed world, with the words "Arise, shine; for your light has come, and the glory of the Lord has risen upon you."[12] Isaiah then describes the New Jerusalem as a transformed city, with animals, sailing ships, lumber, and precious metals all serving God's good purposes. In fact, these items have

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[11] VanPoolen, Lambert. *Technology: Human Responsibility and God's Grace*. Unpublished book manuscript, 2004.
[12] Isaiah 60:1

been mysteriously transformed from their known purposes to, as Richard Mouw says, "be put to the service of God and his people."[13]

Engineers are well acquainted with a different but similar process of transforming ordinary things around us into new things for new purposes. You did just this for your Senior Design project. You purposefully created something new and useful (actually, *redemptive*) out of stuff you found around you. And, you'll do much more of this transforming in your future career. Could it be that some of what we engineers create in the present world will inhabit, in mysteriously modified form, the New Jerusalem? How should that affect our designs and design activities? Certainly God will do the transforming on the last day, but, even now, should we be pointing in that direction? If so, how? How can our engineering activities point toward God's ultimate transformation when the New Jerusalem is established?

These questions present us all (and engineers in particular) with an awesome burden and important responsibility. Jesus' parable of the talents amplifies the importance of doing this well.[14] In the parable, the Kingdom is seen as a master who gives physical (in this case monetary) resources to his servants. The servants are entrusted with the resources and clearly expected to exercise responsibility and care for them. In fact, they are expected to improve the situation, to make it better, to make a return on the investment. I submit to you tonight that God has entrusted us with the physical resources of the creation. God the Master asks us, challenges us, to improve the world around us, using the resources that have been entrusted to us. So, make really cool and useful redemptive things out of what you find around you, what we have been entrusted with.

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[13] Mouw, Richard. *When the Kings Come Marching In: Isaiah and the New Jerusalem.* Revised Edition. Eerdmans, 2002, p. 23.
[14] Matthew 25: 14–30

When viewed from Mouw's perspective, you'll also mysteriously participate in the preparation for the kingdom to come.

God calls us to use our creative energies for redemptive purposes. We engineers need to create responsibly and well. That's why we professors expose you to concepts like *responsible design* and *responsible technology*. To equip you to carry the burden and rise to the responsibility that Isaiah 60 presents, we together discuss, study, and apply "design norms."[15] The norms do not provide specifications for your designs, but they can offer context for designing useful things well. I encourage you to refer to these norms throughout your career. May they undergird your engineering activities in the years to come as you consider both the contemporary and eternal implications of what you create. And may you use them to point toward the coming of the New Jerusalem.

Kingdom Service Through Engineering

Tonight, you and your family and friends should be proud of your accomplishments. Indeed, the culmination of your Kingdom service at this place called Calvin College *is* "good," even if it is imperfect. But, by God's grace, this will be neither the last step in your career nor the end of your Kingdom service through the engineering enterprise.

Whether you knew it or not when you walked into ENGR 101, you placed your finite self at the engineering nexus between creation and redemption in a fallen world. And now you have some experience with this business of creating cool and useful redemptive things. You gained experiences and developed skills to help you make a difference at that nexus. It is my hope that your time at Calvin (and, perhaps, my sledgehammer and circular saw) leads you to reflect on creating, the creation, human finitude, the effects of sin in the world we know, the redeemed

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[15] See Monsma, S.V. *et al.*, *Responsible Technology: A Christian Perspective.* W.B. Eerdmans, Grand Rapids, MI, 1978.

world that we will someday inhabit, and your responsibility to serve God in God's kingdom through your engineering skills.

The challenge moving forward is to use your engineering skills responsibly in redemptive Kingdom service. If done humbly and done well, God, working through your hands, will point toward the future redemption for God's world.