

# Lost in Calculation: The Thermodynamic Miracle

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It dawned on me in one of my calculation-heavy classes. The question had nagged at my mind ever since I decided to pursue the title of mechanical engineer. Is it possible that we inspect, dissect, analyze, calculate, scrutinize and basically look at something so super-close that we lose sight of it completely? I entered this field hoping to pursue a passion of mine, a passion that ran so deep within me that the roars and growls of engines were like lullabies; the smell of gasoline, oil, and burnt exhaust like the most fragrant of perfumes; and the inner workings of a planetary gearbox more awe-inspiring than the most beautiful painting. Saying that I loved machines would be an understatement. But as I inched ever closer to my degree it seemed like that love was waning. Class after class of calculations, deviations, formulations and frustrations soon diluted that love. And then a class came along that revived it, renewed the fascination. The class caused me to rethink all the possibilities that lay before me. It even challenged me to prove that the impossible could be possible. Thermodynamics was a game changer.

I remember the first time I ever experienced the ridiculous power of an engine first hand. I had driven cars for years, but the excitement was never there. Cars always seemed safe, controllable. I never had to worry that I would awaken a beast within. That all changed when I bought my first motorcycle. It wasn't safe. It wasn't controllable. It was a fearsome force that I unleashed on an unsuspecting world (and an unsuspecting me). A creature that didn't care who or what piloted it. An ungodly, unholy source of never-ending power and acceleration which meant that a fraction too much throttle or too much brake meant that I was heading face first into the asphalt—at 60 mph. There were two things that I loved most about that bike, the power and the sound. To not only control such a power but create it as well soon became my goal.

As I stayed the course for my engineering degree, I soon realized that it wasn't all power and roaring engines. From Manufacturing 101 to Kinematics and Calculus, I discovered that not only was engineering extremely difficult but also dreadfully boring. I enrolled in Thermodynamics in the last semester of my Associates degree in Mechanical Engineering Technology thinking it would be more of the same—calculations, dreaded calculations. I was so disheartened by my experiences so far, I had lost sight of why I was even there. It wasn't until the class dove deeper into the realm of engineering that my interests were reawakened. As we studied the laws of thermodynamics and learned how internal combustion

engines worked, I was reminded of that fateful day when I first mounted my personal mechanical fire-breathing beast and was taught a lesson in trying to control something so uncontrollable. In Thermodynamics I learned where the power came from and how to get more. I learned that there were losses: heat, energy, efficiency. I wanted to take all that I learned and all that I knew from my past and make my machine even more powerful than it already was. If power was lost, it could be recovered. If heat was generated, why not use that as energy? What would it take to increase efficiency by 2%? Now there were so many questions that I thought I could answer. It's not that there weren't calculations to do, or problems to solve; it's just that now they applied to the things that made me want to be an engineer in the first place. I even discovered how the 4-stroke cycle could take something as inanimate as metal and generate a noise akin to the slow growl and then roar of a lion. I learned how metal, combined with oxygen, fuel and spark, became an organism that breathed and moved, and worked. It was this realization that made sense of all the senselessness. The laws of thermodynamics became like commandments.

But of all the things I learned in Thermodynamics, the one that inspired me the most was the one that has nothing to do with the machines I love so much. It was that I, like all the rest of the human beings in the world, am one of the most incredible thermodynamic systems ever developed. There was no engineer that calculated and experimented in order to create what we are. It was developed by chance. In the course of millions of years, slight changes and gambles were taken and thrown out into the field. Some succeeded, many failed, but they all led to what we are now. As amazing as the human machine is, we are far from perfect. Even now, slight changes and gambles are being taken; and still, some succeed and many fail all for the same goal, 100% efficiency, or in other words—perfection.

I am pained by knowing that I could never create something as incredible as what I am. No matter what I do, I could never match the efficiency and autonomy that human beings represent. We are thermodynamic miracles. If science has taught me anything, it's that miracles don't exist. All things are meant to be explained with calculations, experiments, and proof. Things don't happen just because. There are always reasons. As impossible as miracles seem, we still exist and that's what will keep me going.

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