Tom Santa Maria 11/14/10

Why Study Geometry?

In defense of the Pursuit that has Oft Shaken my Very Being with Fury

Geometry is very useful for engineers. In fact without geometry, I doubt our cities or homes would look anything like they do. Consequently, our modern lives would be fundamentally different without it. Fortunately for the rest of the world, I *will not* be one of the people designing New York City’s future skyscrapers. For me, geometry, is painful; Euclid’s proofs, agonizing. The translations might as well be in Greek because it is simply all Greek to me. If I were asked: why do you study geometry? Honesty would compel me to reply, because I am in a course that requires geometric knowledge. Despite my own sentiments, I am forced to reflect on what does really make geometry so important. After all, skyscrapers were not being built at the genesis of geometry’s discovery. Euclidean geometry ought to be studied not only to help us organize that which is around us, but to entice human intellectual curiosity and to develop the whole person.

Outside of Euclidean geometry’s useful application as mentioned above, another purpose for this study cited by its advocates is the development of logical reasoning. This idea is nigh irrefutable simply because it is true. Logical reasoning is a fundamental part of Euclidean geometry. The proof necessitates precise sequences of true statements. For example, though this is a gross simplification of the point, you cannot prove two lines are parallel until you have demonstrated that you have two lines (whether that be in given information or information assumed from definitions, postulates, or axioms.) In itself, sound reason is crucial for effective communication and success in other fields, however; this hackneyed purpose for study is not enough. This in many ways cheapens the pursuit. It makes it less about the challenge and more about the ends. Blaise Pascal justly commented on this approach to answer why study geometry:

Mathematicians, who are only mathematicians, have exact minds, provided all things are

explained to them by means of definitions and axioms; otherwise they are quite inaccurate

and insufferable, for they are only right when the principles are quite clear.

In this way, Pascal summarizes the problem with this answer that is in many respects too simple. Not only is he suggesting that there must be some actual application to the world outside of mathematics, but also that in some ways geometry as geometry for the pursuit of logical reasoning will not lead anywhere. In this sense, he could very well be suggesting that other fields are more worthy of effort in that they will yield more fruit to the disciplined student. For example, philosophy is an effective way of studying the world as it is by asking fundamental questions, not just a finite view based on highly specific theories. Furthermore, Pascal suggests that the real world is not defined by precise definitions or axioms. A field that will teach us to go from definition to proof is not always applicable.

Given the classic answer from above namely, we study geometry to develop logical reasoning, the troubled student may continue to wonder, why am I studying geometry? This time though, the question takes on a slightly different scope; what good will geometry do for me, or what will I get from studying geometry? I should not deny that I myself have asked this question many a time. I can recall countless times when I agitatedly stared at a math textbook clenching my hands in tight fists and saying, *I know how to add, subtract, divide, multiply. I know fractions. I know decimals. I know my shapes. What more do I need to know? I’m not going to have a job that deals with math anyway!* I indulge in this thinking knowing that it is fundamentally wrong. I discovered this a few weeks ago when I happened to overhear a conversation amongst a few Holy Cross students talking about their potential majors and their future plans. Every time someone suggested a major whether it be history, math, classics, philosophy, chemistry, language, or even biology the study was harassed by a chorus of, “what are you going to do with thats!?” This eavesdropping turned out to be highly productive for me because it was so thought provoking. As a recently declared double major in history and classics, it is impossible for me to agree with that logic. Could it really be possible that the only fields one can “do things with” are pre-professional majors? I think not. Perhaps some of these fields do not have direct practical application, but that does not make them impractical. Euclid has a wise answer for students who believe in what I will call the pre-professional misconception:

Someone who had begun to read geometry with Euclid, when he had learnt the first

theorem asked Euclid, “what shall I get by learning these things?” Euclid called his slave

and said, “Give this man three obols, since he must profit what he learns.”

Though Euclid is not with us, this statement is so sharp that it is as if you can hear the distaste in his voice. Certainly, the Greek conception of education was not for the pursuit of profit per se but for the greater glory of man, although they might not have necessarily couched it in this way. Furthermore, there is certainly a hint that learning is for the sake of learning. In other words, it is a gift enough to learn.

On a personal note, granted I dislike math, in many ways the study of math and geometry more specifically sort of fits into a personal belief system. That is, because it is hard, I should do it. Albeit, I likely get more frustrated working out math problems than most people, I still appreciate the challenge for what it is. This is the same reason why I have pursued many of the things, which I now call my hobbies. Running is an ideal example. When one begins running more often than not, one is not excellent, I surely was not. Over time; however, one improves, yet this does not make the act of running any easier. A one hundred percent effort is consistently a one hundred percent effort. To me geometry is similar in many ways. When I was a child I am sure at first that I was unable to put the triangle in the triangle slot. Now I could do this with my eyes closed so to speak. When I got a little older I may not have known many properties of a triangle. I now know many, yet this does not make proofs any simpler. Ultimately, there is a long and challenging progression of things to learn, or better yet, discover. In a certain way, I cannot help but feel like the hours of frustration only make me better. Furthermore, those same hours of frustration equate to unparalleled euphoria when that formidable proof is proven. There is a great satisfaction when the Herculean task of making a series of assumptions justify a claim culminates with the victorious Latin phrase, Quod Erat Demonstrandum.

In contrast, and on a more universal note, as someone who would like to be a teacher, I feel inclined also to defend education. As an aspiring history teacher, I think back to the roots of what I consider formal education known as , Plato’s Academy. Think of Holy Cross without the buildings, without the science labs, without the chalk boards, without the state of the art facilities of which it prides itself, and you have what many historians would say the Plato Academy looked like. A group of people wanting to learn gathered in an orchard. I mention the Plato Academy specifically because of its famous proclamation, “Let no one destitute of geometry enter my doors.” This particular statement is important for many reasons. In some ways, I dare say that if Plato suggested to do something, it is likely something that I would aspire to do. Beyond that though, the emphasis on geometry is interesting given that Plato’s interests are often thought of as purely philosophical. In this way, it is made clear that varying fields of pursuit inherently intermingle to form education.

Imagine the human body without the thyroid. In other words, consider the human body without one of its key pieces that regulates hormones in control of mood and metabolism. Without this small, but crucial part people could become emaciated, grossly overweight, or be subject to mood swings. It is in this way, that I like to consider the fields of the classical liberal arts education and beyond. Without any of its elements it can be said that there could be a flaw possibly minor, perhaps major in a person. Without some concentration in all aspects that make us human, life would be somewhat meaningless. This includes physical exercise. The consequences of humans without any physical activity would surely be catastrophic. Without all these intricate parts there is a characteristic weakness. This is not to say that everyone should strive to intensely study all things. Surely, there is a necessity for people who are not only masters in various subjects, but also people who have passion for them. This makes rivalry possible, and competition lends itself to progress. On the other hand, if a person seeks only to excel in one thing the communication due to lack of understanding makes rivalry impossible and may thusly result in a regressive world.

What is undeniable is that Euclid’s *Elements* has become the second most influential piece of western literature after the Bible. Like the Bible, this has happened for a reason. So many books are written every year, and so many are cast aside. To think that the Elements has stood for millennia is perhaps inconceivable to the mortal mind. To me as a history minded person this is entirely indicative of its power. Thus, I am compelled to ask: what is it that makes this textbook so revered by peoples of all types and all centuries? My conclusion is that in some way or another, it touches the core of humanity. It is the foundation of answers to basic human questions. It gives truths to an inquisitive species looking for answers. Q.E.D.