



# Assumption University

**Commencement Speaker Address – Dr. Aaron Dominguez,**

**Undergraduate Class of 2024 Commencement**

May 12, 2024

Introduction

President Weiner, deans, administrators, honorable guests, families and friends, thank you for inviting me to share this moment with the Class of 2024! Congratulations! It is an honor to be here with you and your families at this beautiful college named in honor of our blessed mother. I'm Aaron Dominguez, as you heard, I'm the provost at CUA which has 12 colleges (we call them schools) and a physicist. I often get asked what Catholic education is, or how it is different from some other kind of education, and how on earth you could reconcile particle physics with faith!

What is a Catholic Education?

So, what is a Catholic education? Is it theology? Is it philosophy? Is it praying? Is it the visible symbols of our faith? Is it going to Mass and receiving the sacraments? Is it living out a good life with our brothers and sisters? Yes! It's all of those things! But what about psychology, or sociology? OK, maybe we can do this if we understand what a human being is: made in the image and likeness of God. What about literature, English, history? Surely, there is some good stuff there that fits in a Catholic worldview. What about art, drama, music? There's probably some good stuff there too, I suppose, right? What about calculus, or physics? Surely there is no such thing as Catholic calculus, or Catholic physics, is there?

Story of the Search for and Discovery of the Higgs Boson

Let me dig into this a bit by telling you a brief story that happened to me in 2012. I promise it's a very brief story, and it only

begins... 13.8 billion years ago! Just kidding. Actually, not kidding. 13.8 billion years ago, the universe came into existence out of nothing. The whole thing. There wasn't any space or time before this creation – it wasn't empty, it just was *not*. The universe rapidly expanded and evolved into this beautiful creation, this beautiful creation that we see around us today, and it did so following physical rules and principles that we are miraculously able to comprehend and understand somehow. Throughout the twentieth century, scientists were able to peer ever deeper into the fabric of the universe and study these physical principles ever more exquisitely.

In the 1960s, it became clear that something important was missing from our picture of these fundamental particles and interactions. The missing part of the puzzle was how some of the particles acquired their masses, the thing that gives them “weight.” In particular, there was a major problem explaining why the particles responsible for the nuclear forces weren't all

zero. Some really clever physicists in the mid-1960s proposed a solution to this puzzle, but it required the existence of an unknown, previously undiscovered particle and basically a new force of nature: what we now call the Higgs field, or the Higgs boson.

OK, so what? Who cares. Well physicists cared. Not many other people did, but physicists did. They cared a lot about this. This in fact is a key part of this story. Remember this for later.

So the generation before me, the people who taught me physics as a student, began creating and carrying out experiments to see if they could produce one of these Higgs particles in the laboratory, observe it and measure its properties. They did so in a number of ways, but the primary kind of experiments were things commonly called “atom smashers” or particle accelerators. They accelerate small particles like electrons, or protons (the nuclei of hydrogen atoms) to very high speeds using magnets and electromagnetic fields that the particles surf on, like

a surfer does on an ocean wave. They get sped up to super high speeds close to the speed of light and they are aimed into a target of other atoms or into an oncoming beam of particles heading the opposite direction and create a tiny, but very intense explosion.

So hundreds of my physics forefathers built super clever experiments to find evidence of this Higgs boson, but couldn't. And then many more smart people, thousands, built ever more clever and powerful experiments that took years to conceive and complete. And then I came along as a student in the 1990s and thought I was kind of hot stuff, mister smarty pants, that this would be a great topic for my PhD dissertation topic. Maybe I could be part of this discovery.

And in 1998, I finished my dissertation for the search for the Higgs boson in collisions of electrons and the anti-matter version of electrons at the Large Electron Positron Collider at the CERN Laboratory in Switzerland. And... I found... nothing! A null

result. I and my many colleagues did not find it, but at least we continued to rule out where it was *not*.

And then thousands of more scientists from around the world kept joining the hunt and built an even more powerful accelerator and set of experiments. Our university's team of physicists and students were literally part of a world-wide effort of many thousands of people to try to find this esoteric particle. When you go down into the huge underground cavern where these experiments are carried out, it's like being on the set of a science fiction movie with the craziest scientific instrument you can dream of with thousands of people from all over speaking all different languages. It's like a science fiction movie, but it's real!

And then on July 4, 2012, on my 43rd birthday, the two competing teams of thousands of scientists each announced the results of their searches for this Higgs particle. The announcements were made live in the large auditorium at CERN and live streamed into other conference rooms at CERN and on the internet. Both

teams had discovered a new particle consistent with the Higgs boson, and they each confirmed each other's results. It was a conclusive discovery that had taken the works of thousands of the world's physicists from 1964 to 2012: 48 years. Half a century.

When this happened, the auditoriums and conference rooms erupted in cheering, shouts and tears of joy. Hugs, high fives. I've never seen anything like this: thousands of scientists all in communion with one another in an ecstasy of joyous discovery!

### The Search for Truth

So what's the moral of this story? Why did these logically minded, somewhat nerdy, rational people spend decades, even a lifetime, doing this, searching for a tiny, esoteric particle?

It was the search for the truth.

Sure, lots of practical things came about because of the technical advances needed to build and operate these accelerators and

detectors, like ways to detect and treat cancer, how to operate very sensitive equipment in very harsh environments, heck even the world-wide-web, the hypertext protocol, was invented at CERN to help scientists communicate. But the reason for doing this, the true motivation, was the acknowledgement of and the search for a profound truth about how the universe works at a fundamental level, from the beginning of time and space until now and into the future.

This is a very, very Catholic thing to do. Even if many of the actors involved were not Catholics themselves. Our faith has a logical scaffolding that has as its source the Truth, with a capital T! And we've been made in such a way that not only can we do this, but that it is good to do this.

Searching for something tiny, the tiniest structure of the universe, was something in a very real sense larger than all of us. That search for the Truth unified us and made it possible.



We needed friendship to make it happen, which flows from the created nature of Man. The joy experienced that day, by those people together, was very real and very profound. Joy overflowing into tears and embraces.

### A Very Human Endeavor

This shows that the search for what is true and good is a very human endeavor. AND, it can be done in ANY discipline. It flows from our loving creation as people made in the image and likeness of God. There is something within us that wants to know, wants to explore. In fact, this is why there are people everywhere in the world and even outer space. By orienting ourselves, our efforts, our very lives, towards those good things, we are participating in God's plan for us.

This is what Catholic education is for. This is what it has given you and the world. It leads you closer to God by participating in his plan. Finding what is good, beautiful and true. Orienting ourselves towards that, orients ourselves towards Him.

## A Lifelong Journey

This is of course not always easy to do! I mean, the two most obvious facts of life are that God exists and we're going to die. And yet, we go about the day living it as if neither of these were true! At least, I know that I'm guilty of such things. This is of course a lifelong journey. But you can do it as a lawyer, a nurse, a businessman, a teacher, a professor, a soldier, a mother, a father. As we finish this commencement exercise, we are not ending something, we are beginning, you are COMMENCING this next step.

Catholic education gives us examples and a road map of how to orient ourselves to bring the love of Christ into the world by sanctifying our work.

That's where happiness is.

Thank you, congratulations, and God bless you!

