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Find your dream job—in 10,000 easy steps | Cullen Buie

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The Veritas Forum

PART OF A SPECIAL 6-WEEK SERIES | Do you have to follow your passion to have a meaningful career? What if you don’t have a clear direction in mind — or a detailed five-year plan? We talk about finding and pursuing your vocation with MIT researcher and entrepreneur Dr. Cullen Buie. After a chance conversation right out of high school introduced him to engineering, Cullen has asked one key question in his professional journey: “What do I have to lose?” Hear how this question has guided Cullen along his career path and learn how you can apply it to your own life in this week’s episode. Like what you heard? Rate and review us on Apple Podcasts to help more people discover our episodes. And, get updates on more ideas that shape our lives by signing up for our email newsletter at www.veritas.org Thanks for listening!

Transcript

The average person spends one-third of his or her life at work. That's about 90,000 hours over the course of a lifetime. Choosing a career then is a big deal.

It's probably the biggest creative problem that you'll solve in your life. But how do you approach it? Do you follow your passion? Do you accept the first job offered? My guest today is Cullen Buie, a professor of mechanical engineering at MIT. You might think for someone like him, someone at the top of his field, at the top institution in his discipline, he's focused on his career and made deliberate decisions about his vocation for most of his life.

But that's not what Cullen did. I heard this analogy of there being mountain people and river people. Mountain people are the folks who in eighth grade, they started a robotics club.

And then in high school, they did first robotics and they've always wanted to be an engineer and they got into coding and they took all the math classes at their high school. And then they come to MIT and they're going to major in electrical engineering and computer science. And they're still involved in robotics and then they get an internship

at Amazon doing AI.

And they're like, "Whole life has been electrical engineering and robotics." You look up 30 years later in their vice president for robotics and automation for Tesla or something. And it's like, they've kind of been on this path up this mountain. Like there's like this singular goal of this place where they're trying to go.

And that's kind of one way of navigating life. Cullen has met a lot of those people and there's nothing wrong with them. But Cullen isn't one of them.

I'm more of a river person. Like when you're on a river, you actually don't know where it's going. Right? It goes around this mountain.

It goes through this forest. It's moving. It is going somewhere.

But you don't see the whole path while you're on it. And that's how Cullen has approached his career. He's never followed a well-crafted, deliberate path.

Instead, he's gone with the flow. He's been curious in the moment. He's asked, "What do I have to lose?" He hasn't just paid attention to his passion, to what makes him tick.

He's also paid attention to his pain and suffering and wondered if there are ways to solve for it. And that mentality has led to several twists and turns in his life, even to now working on technology that could end up saving his own son's life. This is Beyond the Forum, a podcast from the Veritas Forum and PRX that explores the ideas that shape our lives.

This season, we're talking about the intersection of science and God. I'm your host, Bethany Jenkins, and I run the media and content work at the Veritas Forum, a Christian nonprofit that has conversations that matter across different worldviews.

[Music] When I was in law school, someone asked one of my professors what the best undergraduate major is for law students.

Without hesitation, my professor said engineering. At the time, I didn't know what he meant. But as I've become more familiar with what engineers do, I get it.

Engineers, like lawyers, solve problems. And solving problems, especially at a system level, often involves thinking about things that might or might not happen. It involves thinking about risk.

And when it comes to engineers at least, it involves thinking about risk with an eye to build something. Cullen is a mechanical engineer, which is probably one of the broadest engineering disciplines. And his particular area of research is in microfluidics, which looks at how fluids behave through micro-channels.

We're talking tube sizes of around 100 nanometers to 500 micrometers. For reference, a sheet of paper is about 100,000 nanometers thick. So at the smallest level, Cullen is looking at how fluids behave in channels that are 1/1000th the thickness of a sheet of paper.

In practice, what does this work mean? My group looks at ways of delivering genetic material into cells. We flow cells and then we zap them. And that opens pores in the cells that allow gene editing constructs you can get in.

You can change how the cells function. You can get a living organism to become a therapy. And it's this work, work that intersects with everyday therapy applications that is shaping his work in incredible ways today.

More on that later. Hi all, this is Carly Regal, the assistant producer of Beyond the Forum. If you're loving the podcast so far, we want to invite you to continue engaging in these important conversations by signing up for our newsletter.

Each month you'll receive thoughtful content about the ideas that shape our lives, updates from our student and faculty partners, and other Veritas news and events. You can sign up today by visiting veritas.org. Thanks for tuning in and enjoy the rest of the show. Microfluidics wasn't always what Cullen thought he would be doing.

In 1999, when he was finishing high school, he went on a road trip with his dad that would be the first time he'd simply follow the river about his career. My youngest brother was in a football camp at Ohio State, which is where I was going to school. So I go down with my father to pick him up and my dad had the idea, which was a great idea, to meet some administrators while I was there.

And when I met those administrators, they were interested in some work that I had done in high school through a group that was trying to bridge the achievement gap between African American men in particular and the rest of the population in the school. And it had been written up in Newsweek and someone at Ohio State had seen the article and wanted to talk to me about it. So I was talking to them about this program, then they asked about my major, and I said I was undecided, I wasn't really sure.

And they asked if I considered engineering. Not only had he not considered engineering as a major, he didn't quite know what engineering was. I was totally clueless.

They send me to the College of Engineering. While there, I meet a woman named Minnie McGee, who was the Associate Dean for the Minority Engineering Program at Ohio State. And she's telling me about engineering, and then she tells me about a program that they have at Ohio State called Preface, where students come in and spend six weeks on campus taking engineering classes and learning what engineering is about.

And she asks if I would like to join the program. I'm like right there on the spot, and I

talked to my dad about it, who was there with me, and we just kind of decided right there on the spot like, well, I don't know where this will lead, but yeah, I'll try it. And this was a Friday, and the program started that Sunday.

His thought process was, what do I have to lose? Made a bunch of good friends, enjoyed the classes, and decided, engineering is going to give me some options. I don't know what I want to do, but this will give me some options. That's good enough for me.

I chose mechanical engineering because that was better than undecided. Mechanical engineering was very broad, and because I wasn't exactly sure what I wanted to do, I wanted to get a nice broad background. And when Colin got to Ohio State, he continued to follow the river.

By attending talks, he didn't know a lot about, like one with Gregory Washington. Today, Professor Washington is President of George Mason University. But back when Colin was an undergrad in the early 2000s, Professor Washington was an assistant professor of mechanical engineering at Ohio State, and one of only two or three African American faculty in engineering.

So, Colin attended a national society of Black engineers meeting where Professor Washington was speaking. And he gives a whole talk on how to succeed academically and get good grades. And then at the end of the talk, he said, "If you're in this room and you're a mechanical engineer, you need to get to know me." And I don't know what other people did, but I emailed him, and I started coming to his office and just asking questions.

And after six months or so of this, he invited me to join his lab to do research. And again, Colin was curious. He wasn't sure what research was in this context, but he needed a job.

That's actually how it started. I was saying, "Hey, do you know where places where I could get a job on campus, make a little extra money?" And he said, "Well, you could work in my lab and do some research." And I was like, "Well, I don't know what that is, but this sounds like something academically oriented. And if I can make money and do it, why not try it? I'll try it." And Colin liked research so much that he decided to continue it.

He applied to Stanford for grad school, but he didn't have some big vision of mechanical engineering. He just kept saying yes. I initially came to Stanford just to do the master's degree.

I had two things I was interested in. I was interested in micro- and nanoscale systems. That seemed exciting.

I was also interested in clean energy. And I met a professor, his name was Juan Santiago, and he just so happened to have a project starting up using microfluidic pumps for fuel

cell systems. So it was like energy and micro-scale engineering in the same project.

It's like, "Well, this seems fortuitous." So I jumped in on that. And again, he enjoyed the research so much that in order to keep doing it, he had to get a PhD. So he stayed at Stanford for that.

I had no plan of being a professor, no plan of... I had no plan. I had no plan. But something happened after Colin was at MIT.

When he was about 27, that shaped his research focus. His sister, who was 35 years old, married, had two kids, was a radiologist, died of sepsis. Sepsis is a range of things, but essentially, it's a bacterial infection that causes your immune response to go out of control.

Your body starts sending all kinds of mixed signals to try to fight the infection, but your immune system gets overwhelmed. It overcompensates and a cascade of events happen. Like your blood pressure goes up and your organs start to fail.

And that's what happened to Colin's sister. In her case, she had had a very minor medical procedure like three weeks earlier. And what was suspected is that that led to the infection.

The challenge was she had some other health complications. And so, for example, she was prediabetic. And so her blood-goog close levels were all over the place.

So they're chasing all this other stuff and didn't even know to look for sepsis. It was this unexpected and unwanted thing that happened in his life, the death of his sister, that led him to look into bacteria and now has shaped his career. I didn't realize that people died of infections.

Like when people get sepsis, they die roughly 50% of the time in the United States. This is when the infection has gotten so out of control that your body goes to this kind of catastrophic response. So that was just crazy for me to learn how common it was.

Many people that have other illnesses ultimately die of sepsis. Like you have cancer. The cancer leads to the infection.

The infection leads to sepsis. And that's ultimately what leads to many people dying. And so that was the part for me was just how little we even now are able to do for bacterial infections.

And it's a situation that is maybe even getting worse when you look at there's there's been a proliferation in bacteria that are antibiotic resistant. Quite often, I think people look for their vocations by asking themselves what they're good at, what gives them joy, where they find their passion. But some of my favorite people are working in areas

where they experienced pain.

And they followed that pain into a calling. For example, my friend who opened up to her elementary school guidance counselor about being orphaned at a young age is now a school guidance counselor. My friend who never felt seen as a child is now a portrait painter.

And here, Colin experienced the pain of losing his sister to a bacterial infection. And he wondered if there was a way to lessen that pain for others. So he became fascinated with bacteria in the microbial world.

What I learned very quickly was that my skill set wasn't very well suited to solving the biggest problems in bacterial infections. So while I was interested in it, the things that I'm good at didn't necessarily lend themselves to solving those problems. But he learned other problems that he could help to solve along the way.

One of the problems I learned about is that in order to develop new antibiotics and to understand microbial infections, it's useful to be able to genetically engineer those organisms. But then I recognized that most bacteria can't be genetically engineered. Well, this seemed like a problem.

Maybe I could have some influence on it. And as it turns out, solving this problem could have huge applications. Cellular engineering is the process both of enhancing or providing new capabilities to living cells and of producing these enhanced cells at scale for therapeutic purposes, like infections, genetic diseases, sepsis, and many cancers.

But the process of creating these enhanced cells can be slow and costly. And so I saw this opportunity to impact a problem that would have wide ranging implications. If you can make genetic engineering of cells faster, that have fundamental benefit, but then also very practical commercial benefit.

A few years ago, Colin and his friend co-founded a startup called Kydopin to speed up both the discovery and delivery of engineered cell therapies. So for example, a cancer patient could receive life-saving cellular therapy within days of diagnosis rather than weeks. Pharmaceutical researchers could bring new treatments to market in months rather than years.

But again, following the river, there was another unexpected pivot. So we were originally looking at companies that were looking to use technologies like ours to engineer cells for cancer. And then within the last couple years, we've learned about applications in hemoglobin opathies like sickle cell disease.

And my eight year old son, whose birthday is today, has sickle cell disease. Sickle cell disease is an inherited red blood cell disorder in which there aren't enough healthy red blood cells to carry oxygen throughout your body. Those who have it usually have a life

expectancy between 40 and 60 years.

The exact number of people with sickle cell disease in the United States is unknown. But the CDC's best guess is about 100,000 Americans. And it adversely affects the African American population.

One in 13 African American babies is born with the sickle cell trait. And about one in every 365 has sickle cell disease. And once again, Colin made a pivot that was not the plan.

The company was started to engineer bacteria. And we since learned that it could be used on human cells, and not just could it be used on human cells, it could be used on human cells for sickle cell disease. I'm looking at this.

This feels divine, like the way that it was set up. Because once again, I'm the river person. I don't know the path as I'm on the path.

And so when you arrive at a coincidence like this, this just feels like too much to just say like, Oh, that's random coincidence that I would start this company and five years later, it could be working on technology that could help my son. Like, it just seems it just seems like too much too much. And yet just right.

Colin's research continues to drive new applications. And it's not the end of his story. Who knows the new research that he'll discover as he leans into his discoveries.

When it comes to career exploration, the key for both mountain and river people, like Colin, is to embrace curiosity and wonder, even about the things that bring us pain and suffering in our lives. When we view the world this way, we see new things. When Colin sees the world, even the most minuscule bacteria in its possibilities, he's amazed.

And far from the intricacies and realities of science being impediment to his Christian faith, scientific knowledge and discovery, enhance it. I actually get more faith like in the brilliance and the just the awe of the creator that we have the detailed chemistry and biochemistry of DNA from that to the astounding physics of black holes and just the dynamic range and scales of our physical world and the level of detail at all the scales. It's just amazing.

So I actually become more in awe of God, not less as we understand more others become more in awe of humanity as we understand more. Like, oh, look at look at all this stuff we know, but we didn't create any of it. For him, there's no tension between believing in a magnificent, wonderful, and powerful God and digging deep into science and biology.

It's beautiful to understand something new. It's like as we understand something like, wow, look at this marvelous world that God set up. So where did this tension between

science and religion come from in the first place? That's what we cover in our next episode.

It's about fake news, a history lesson about how two men in the 19th century manufactured a conflict between science and God. You won't want to miss it. Hi again.

This is assistant producer Carly Riegel. To end our episode, we up beyond the forum want to take time to say thanks to all the folks who helped us get this show together. Our first thanks goes to our guest, Dr. Colin Bowie.

Thank you for joining us and for reminding us of the importance of curiosity. We also want to thank our production team at PRX. That's Jocelyn Gonzalez, Genevieve Sponseler, Morgan Flannery, and Jason Saldana.

And of course, we want to thank the students who host and plan these forum conversations, as well as the John Templeton Foundation and all of our donors for their generous support of our conversations. All right, that's all for this episode. Thanks for listening to Beyond the Forum.

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