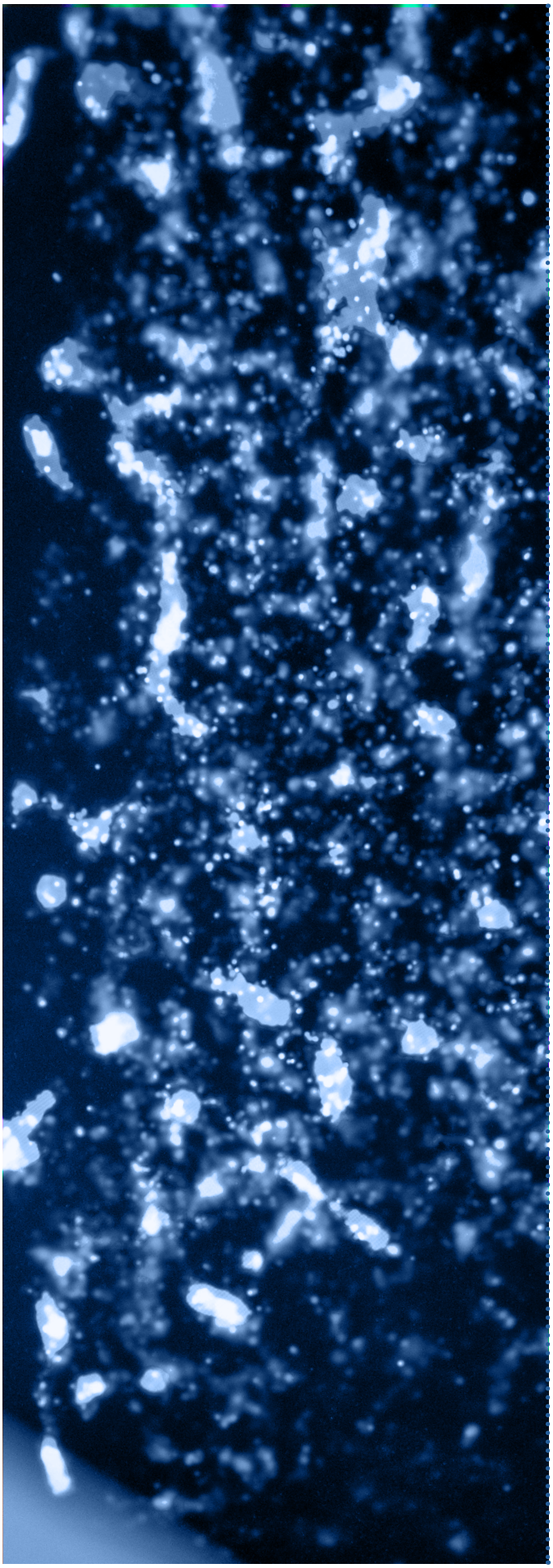
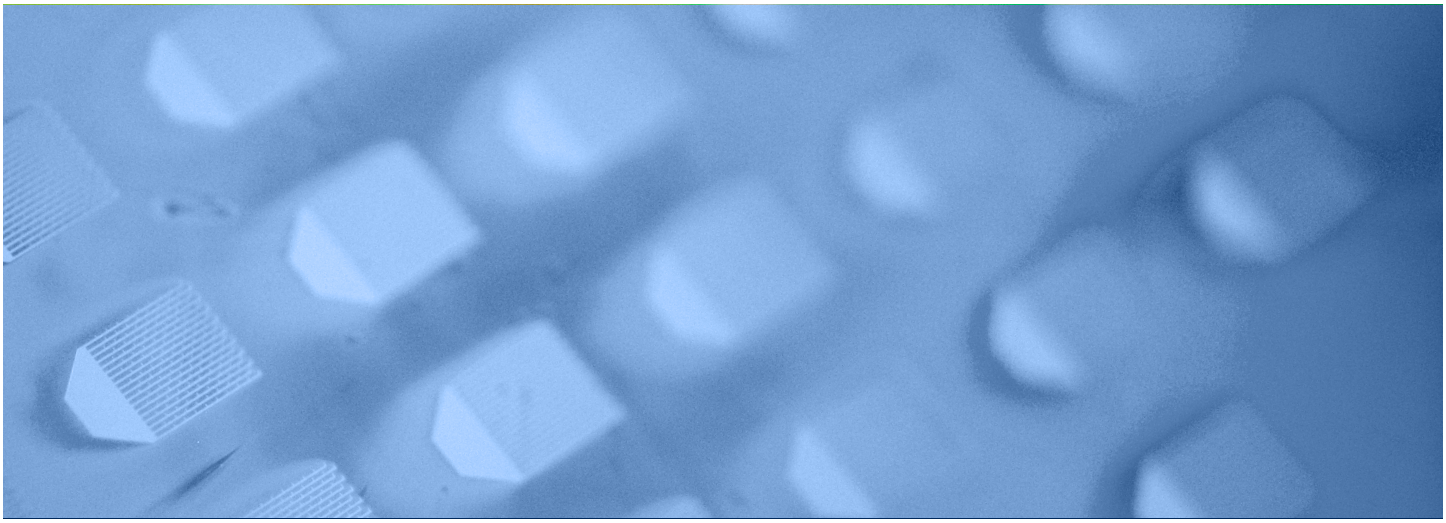


The Cognition Chronicles

Vol 1. Issue 1
Summer 2024



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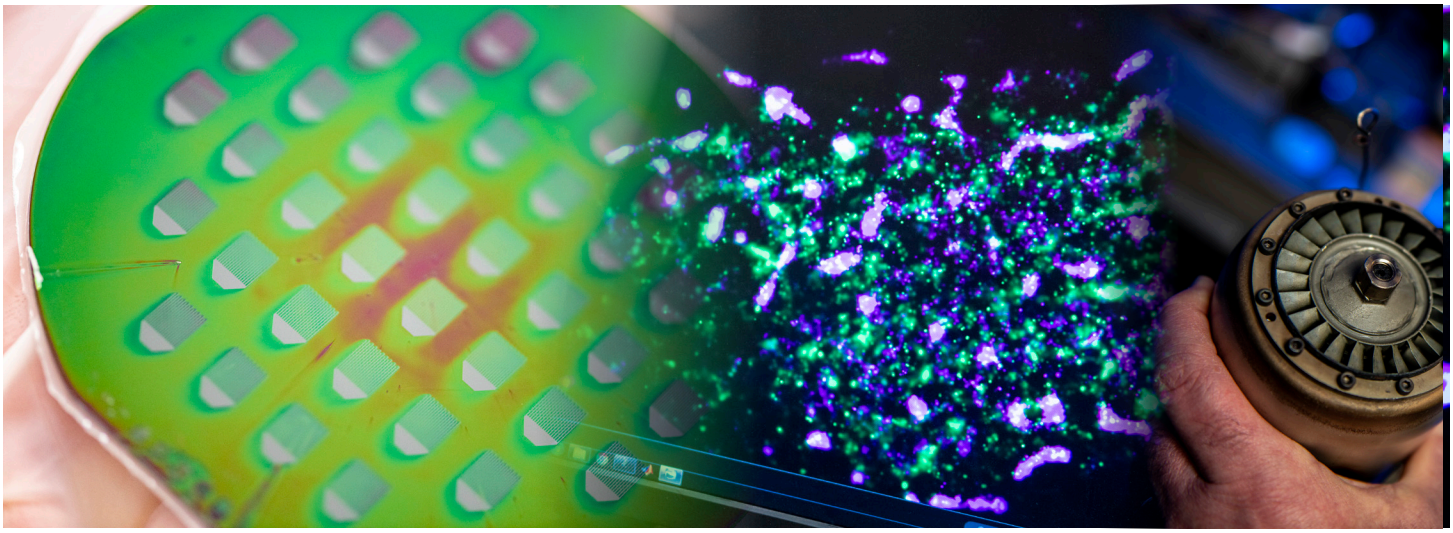


Introduction

By Rajat Rai
Ph.D. Biomedical Graduate Student

> ***"We get into the habit of living before acquiring the habit of thinking."*** - Albert Camus, *The Myth of Sisyphus.*

The irony of inaugurating a journal meant to foster independent thinking among students with someone else's thoughts has not eluded me, but since Camus was able to pen his thoughts down decades before any of us, it is only fair that we bestow upon him the respect he deserves. There is a reason great thinkers command such reverence ages after their existence, and also why they are referred to as great thinkers- their thoughts. Thoughts and ideas pervade through space and time, unbridled by the restrictions imposed upon the thinkers. Camus himself was preceded by another Frenchman who had famously proclaimed, centuries prior, that thinking was the essence of existence. In addition to his famed proclamation of "I think therefore I am", Descartes had made equally pivotal contributions to Mathematics and Physics, making him a polymath in the eyes of many. I, however, prefer the much simpler label of thinker, which also encapsulates what we, as students in STEM, truly are.

Strip the numerous disciplines of STEM to their very core, and what remains is the pursuit of knowledge and wisdom through thoughts and ideas. The differences, as such, between the disciplines, are not a result of their nature but that of the pursuit. The journey, however, differs not only across disciplines but also among individuals. At times these journeys stem (pun intended) from similar places, while at other times, significantly divergent ones. For some, it may have been a singular catalyst that got them started while for others, an accumulation of events. In this issue, we will explore such starting points of 8 independent thinkers, who have my gratitude for taking the time to think about and share a part of their unique journey with us. I would also like to extend my gratitude to the Dean of Maine College of Engineering and Computing, Dr. Giovanna Guidoboni, a fierce thinker in her own right, for her support, Christopher Karlen, Communications Specialist for Maine College of Engineering and Computing, without whom this journal would not have seen the light of day, and Cole Jarvis, for capturing the essence of the pieces through his photographs.

Hoping that these writings invoke original thoughts among other fellow thinkers, we commence with a story from Jack Dunning, a senior studying Biomedical Engineering at UMaine-Orono. In his story, Jack shares recollections of his creative childhood, his love for building, and quite possibly, breaking things. He also details some wonderful memories he shared with his parents that ultimately led to him pursuing this path.

Jack Dunning

Senior, Biomedical Engineering,
Electrical Engineering Minor

Many people stereotype engineers as being nerdy, and while there might be some truth to that perception, I've come to realize that engineering is far more diverse than meets the eye. Sure, engineering involves building, breaking, and even occasionally blowing things up, but it's the intricacies in between that have shaped my journey. Before I delve into how I arrived at this point, perhaps it's best to clarify where "here" actually is. My name is Jack Dunning, and I'm a senior engineering student at the University of Maine, pursuing both a Bachelor's Degree in Biomedical Engineering (with a minor in Electrical Engineering) and a corresponding Master's Degree through an accelerated program. It might sound cliché, but I truly believe that engineering is my calling, and I'll explain why.

When people hear that I'm an engineering student, they often make assumptions about my upbringing. Indeed, I was what you might call a "LEGO kid," fascinated by cars, planes, and how machines were built. Engineering perfectly blends my love for science and construction. Fond memories from my childhood include repairing an Xbox with my dad and conducting experiments with dry ice alongside my mom (though I must apologize for the exploding water bottles, Mom!) So, while it's difficult to explain exactly what engineers do, for me, identifying as an engineer is the most authentic way to introduce myself. It's no secret that my parents played a significant role in shaping my career path. By the time I was born, my father had already amassed degrees in electrical engineering up to the Ph.D. level, and he always shared his passion for the field with my siblings and me. I have vivid memories of him regaling us with tales of exciting projects, whether it was programmable robots or drones he brought home from his job at UMaine. His enthusiasm was infectious, and I looked up to him immensely. But my mother was equally influential, steering me towards Biomedical Engineering. While she wasn't an engineer herself, she had a strong scientific background, earning degrees in chemistry and pharmacy. Her fascination with chemistry and biology, combined with her career experiences, instilled in me a deep

appreciation for the intersection of medicine and engineering. Our evenings often revolved around medical reality shows, a testament to her fascination with chemistry, biology, and the interactions between them. Overall, my journey into Biomedical Engineering is a fusion of my upbringing, influenced by my parents' passions and my own curiosity. From childhood LEGO creations to captivating dinner table discussions, each experience has shaped my determination to grow and explore life within engineering.

The next story is that of Marie Wood, a senior Mechanical Engineering student at UMaine-Orono. Like Jack, her family played an influential role in her decisions, albeit in a different light. She shares one of her first encounters with the curiosity of her own mind, and recounts her initial struggles with math and how she overcame them, all while candidly sharing what this journey means to her.

Marie Wood

Senior, Mechanical Engineering

I grew up in a household that subscribed to a lifestyle that preached working hard. Working hard paid the bills, working hard put food on the table, working hard kept our heads under a roof. In my parent's eyes, anything that deviated from that familiar, not necessarily comfortable, but livable lifestyle was a risk. It wasn't that they weren't smart, the risk was simply too great and the opportunity to try something different never presented itself. They never hesitated to tell me of the great things my family members did, like designing one of the first snowmobiles, managing entire law firms, engineering software at popular tech companies - I knew that if I wanted to, I had shoes I could fill.

We could never afford to take a vacation, but one day my parents had scraped together enough money to visit the Kennedy Space Station in Florida. For the first time in my life I knew what curiosity's playground looked like; an overwhelming amount of information met me at every corner, images that I never fathomed passed my eye, and professionals who traveled to space and back introduced themselves to me. From that moment I understood that there was an abundance of knowledge that I had yet to discover, questions I needed to be answered, intellectual challenges that I wanted to face, and opportunities waiting to be found. I took this kindling of passion and ran with it.

In the early years of my high school education I became exposed to higher level mathematics, but it didn't come as easily to me as literature did. The support I received from my literature teachers didn't translate to those in mathematics and the necessary effort by comparison was tenfold. Through the frustration and long nights, I knew that I only wanted that understanding more. I wanted to be able to look at a problem statement and intrinsically solve it without grasping at straws or flipping through a textbook begging for an answer. Eventually my calculus teacher acknowledged that dedicated desire, the work ethic my parents taught me intertwined with a love of learning. I began to learn the tricks, my incessant "why's" were answered, and I excelled to the point I always dreamed of.

After proving to myself that I was capable of doing what seemed impossible, I was confident that I could fill the shoes I was given with the lessons my parents taught me and the motivation that fuels "impossible" dreams. I knew I could take the risk my parents couldn't afford, and pursuing mechanical engineering in college became the opportunity that I knew I could fight for.

If low-resolution images with quotes are to be believed, and friends are indeed family that we choose, the next story follows the theme set out by our previous writers. Avery England, a PhD student in Chemistry at UMaine-Orono, shares her poignant story of what got her interested in STEM. Her story shines light on how science impacts human lives, and also how human connections, in turn, impact science.

Avery England

Ph.D. Chemistry Graduate Student

"Woe to the child who tastes salty from a kiss to the brow, for he is cursed and soon will die," - a 15th-century European folklore describing what we know today as Cystic Fibrosis

Avery England

Ph.D. Chemistry Graduate Student

"Woe to the child who tastes salty from a kiss to the brow, for he is cursed and soon will die," - a 15th-century European folklore describing what we know today as Cystic Fibrosis

When contemplating the experiences in life that persuaded me to pursue a degree in STEM, it is difficult to decide on one reason. Upon reflection, I realized it is not trivial aspects such as being good at math, a high-paying career, or previous job experiences, but what inspired my degree path in STEM resulted from friendship. There is nothing more precious in life than having a true friend. In my freshman year of high school, I was fortunate to meet a happy, bubbly girl who would become a lifelong friend. Like most teenage girls, we were inseparable, which is how I witnessed firsthand the ways advancements in science and healthcare can transform a person's life. My friend has Cystic Fibrosis (CF), a genetic disease that causes severe damage to the lungs, digestive system, and other organs in the body. When she was born in the mid-90s, the average life expectancy for CF patients was in their mid-20s, the age she and I are now. As my friend grew older, scientific research enabled treatment methods for CF to advance rapidly. By the time we were in high school, her life expectancy had increased to her 30s, but she still faced daily struggles that many of us would never understand. It is not my place to detail her battle, but I will mention despite her frequent hospital stays and daily treatments, she was always hopeful for the future. A new medication was on the horizon, one that would nearly stop the progression of her disease. By the time my friend was in her early 20s, the "miracle drug" finally became available, and since then, her life has completely transformed. Not only has her life expectancy soared to age 65, but she can also lead an almost normal life. I am profoundly happy for my friend, and I look forward to the many years we will spend together thanks to the advances in science and medicine over our lifetime. So, while I may not research Cystic Fibrosis like I once declared I would when we were teenagers, it was witnessing my friends' journey that led me to enter education in STEM.

Our next thinker is Josh Hamilton, a PhD student in Biomedical Engineering at UMaine-Orono. Josh takes us through their extremely moving journey where they detail their experiences with love, loss and self-discovery. Josh details how their experiences helped them find their purpose, and how they view what they do today as their duty and an homage to those who inspired them.

Josh Hamilton

Ph.D. Biomedical Graduate Student

I am going to begin with personal anecdotes from my days of yore as I feel it is important to lead you through the highlights of the journey I took to discover my passion for cancer research and teaching as it's why I am a PhD student today. My innate curiosity first reared its head at the age of four in a trailer within Milo, Maine where I found the manual to Super Mario Bros 3 and read how to play the game. My grandparents, parents, and older sisters would all play mario together and with my new found information I wanted a turn. My dad wanted to help me by showing me the buttons, but I yanked the controller away and to my family's surprise I beat the level we were stuck on as a family. This innate curiosity continued into me thriving in school as a "gifted and talented student", but my home dynamic changed in 8th grade. My parents had a meeting with my three sisters and I to announce their divorce. My dad has known he was gay for years and finally felt that us kids were old enough, and that society was safe enough for him to live true to himself. My dad moved out and my mom started dating which left my siblings and I home alone most of the time. I love my parents and they love me, but in hindsight the ramifications from this led me to having little to no accountability. The unbridled curiosity had a dark side as unchallenged by school I found it boring and

highschool Josh just wanted to get home and play video games. My grades did not decline, I just did not do anything hard and took the easiest classes possible. This was until my Sophomore year when my biology teacher brought me aside and asked why I wasn't taking AP classes which pivoted into him asking what my goals were in life. At this point I honestly did not have goals and he forced me to take the steps into independent thought and self discovery that no one in my life was in the right mindset for. Around this time my mom started dating Jimmy who I would soon call my step-dad and I got to know my dad's partner who I still call step-dad. I went from two parents who were loving, but lost in their own problems, to four who were caring and supportive.

Due to this support at home and at school, in my last two years of highschool I enrolled in over 7 college classes, received a jazz soloist award at states, and worked two internships at UMaine in chemical and bioengineering which led to me applying there. I was really living the high of actually challenging myself instead of living in apathy, but the self challenge and my interest in bioengineering were more an egotistical pursuit than anything substantial. A week before graduation tragedy hit my friend group as our soldier, (a nickname given to him by our Iraq war veteran history teacher whom he loved) Aaron, lost his lifelong battle to osteosarcoma. Even writing this now requires me to pause and take a break. This event made me realize the true hard reality of life, and that I want to do anything to make it easier for others. My freshman year of college started soon after and now I pushed myself out of passion, not ego, to succeed. I quickly joined a research lab, enrolled in 19 credits my first semester including honors college and starting in organic chemistry. I remember my habit of waking up before 8 am Organic Chemistry my first semester and hearing behind the screech of me closing the sliding glass door "I love you and have an awesome day" every morning from my step-dad Jimmy as he downed a cup of coffee. It was our ritual we started from when he would give me rides to my summer internships. Little did I know that in less than a year I would watch him struggle and die from late diagnosed pancreatic cancer as my mom tried her hardest to take care of him. To say I hate cancer would be an understatement. How I still feel is that no one should suffer the way my friend and stepdad had too, both taken too early and with so much left to give.

This empathy and reeling from the personal strife induced from loss has driven me to find what Buddhists would call my Dharma in life earlier than expected. I would soon enter the 4+1 program and find my current lab through a pancreatic cancer project, and along the way I discovered a love for teaching. In fact I find tutoring, mentoring, and teaching highly rewarding through connecting with students and creating "lightbulb" moments when concepts click, similar to what my highschool biology teacher did for me. Channeling my inner angst and loss from cancer drives me not only to engineer a cure for cancer but also to train, mentor, and empower others who share similar angst and loss to find solace at the research bench which may ultimately eradicate cancer from our vernacular as a society (or any terminal disease). I am overjoyed to be a part of this empowering opportunity as a researcher and to share my story in this journal. As I continue my academic studies I hope to be in a mentor role to encourage our next generation of engineers and help others channel negativity into positivity. A small aside, my Stepdad was a professor of German, and Aaron wanted to teach history, almost as if life had nudged me into this passion for teaching alongside research. I hope to be able to live up to the expectations of these wonderful people who impacted and then left my life by continuing and sharing in the passion of creating "lightbulb" moments through my pursuit of a PhD.

Teachers often command attention while teaching. Good ones, however, earn it and great ones, embed themselves into their students' minds as nuggets of nostalgia. Aleigha Morgan, president of the Society of Physics Students at UMaine-Orono, shares how her teachers played a pivotal role in helping her cultivate her curiosity and traverse through some tumultuous times during her journey.

Aleigha Morgan

President of the Society of Physics Students at UMaine-Orono

"Absolute travesty takes hold of those who do not understand physics or opportunity. Good fortune and opportunity arise when the good-natured open their own doors to success and prosperity..." - Anonymous

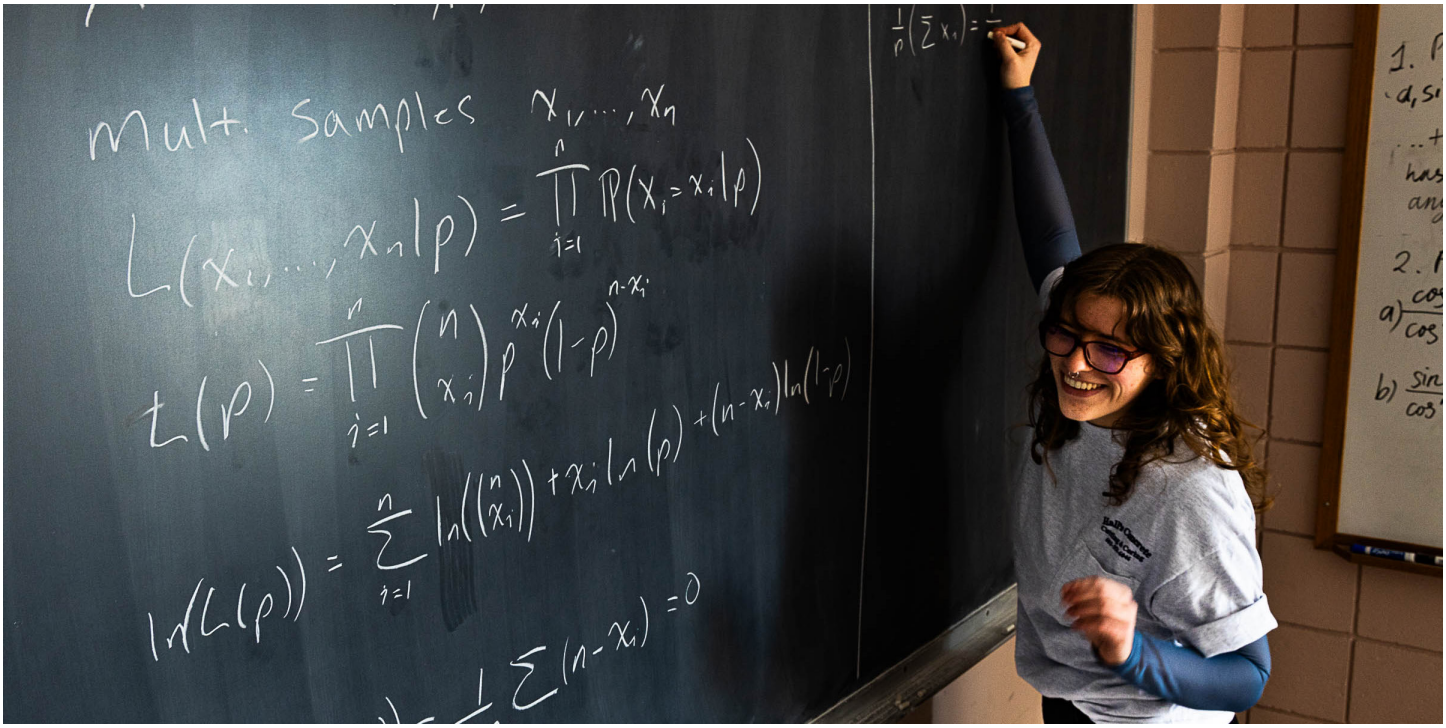
My journey into STEM began in 6th grade, a time when science class became more than just building terrariums. It was when we watched Bill Nye the Science Guy and delved into the basics of force, Earth systems, and weather. Mr. Pearson, my 6th-grade science teacher, was a constant source of inspiration, always nurturing young minds with his encouraging demeanor.

Middle school brought a broader understanding of science and its workings, though the specifics are a bit hazy now. Alongside science, our curriculum included art, music, technology, and life science. It was during these years that I discovered a fondness for art and technology, pursuits that I continued into high school for about two years.

You might wonder why only two years? The answer is simple: self-doubt. Comparison became my nemesis, stealing the joy from my efforts. In high school, where career paths were chosen, I opted for art. However, my confidence waned as I saw my peers excelling far beyond my own abilities, and the lack of encouragement from my art teacher only compounded my doubts.

Meanwhile, I continued with science classes, where things unfolded largely as expected. Biology felt like a review of middle school material, while Advanced Chemistry proved challenging with limited guidance. It was at this two-year mark that I took a hard look at myself and realized that art wasn't my path to success due to my lack of skills. So, I shifted my focus to science, necessitating three additional science classes. I immersed myself in AP Physics courses, seeing them as a gateway to college success. My first venture into AP Physics 1, sans calculus, was undeniably tough. Despite falling just shy of success on both practice exams and the real AP test, my physics teacher's unwavering support kept me going. Mr. Peppard taught me that failure is integral to learning and urged me not to be disheartened by one setback. Thinking back to the quote above found in one of my yearbooks, I have learned to appreciate education and failure as part of success.

Encouraged by his belief in me, I took on AP Physics C and found myself thriving. Over those last two years, I discovered my passion for physics, setting the course for my future. Today, I stand on the brink of graduation with a BS in Physics, supplemented by minors in mathematics and astronomy, and am the President of the Society of Physics Students. While recounting my college experiences would take an eternity, I owe much of my journey to that one physics teacher who sparked my love for the subject.



We are still in presidential territory, as the next article comes from Kaia De Vries, a senior at UMaine-Orono and the president of the Math Club. Kaia shares how her journey was shaped by her natural inclination to math, her love for puzzles and the cathartic feeling of solving one. She also mentions how her father helped her choose the abstract world of Math over other STEM disciplines.

Kaia De Vries

President of the Math Club
at UMaine-Orono

STEM encompasses a broad range of disciplines and areas of study. And, there's no doubt that all of these fields use math in some capacity. In fact students who excel in math are often encouraged to pursue careers and opportunities in STEM because strong math abilities reflect critical thinking and problem solving skills, both essential for success in STEM. So, when I showed a strong interest and ability in math from a young age, I was encouraged to pursue other areas like computer science and engineering. Although I dipped my toe in the waters of other STEM fields, I decided that it was pure mathematics that I really wanted to pursue.

The puzzle-like nature of math has always thrilled me, from solving a tedious system of equations, to discovering the group structure of a dodecahedron's symmetries, seeing all the pieces fall perfectly into place scratches a certain itch. Further, the generalization of statements from individual cases to entire classes, built only on fundamental axioms, fills me with delight! My father always shared and developed my appreciation for the beauty of math and encouraged me to pursue a degree in mathematics. And, being physics and computer science savvy, he was working hard from day one to pull me into STEM.

Now I'm far beyond the math used in many STEM fields, exploring more abstract ideas, many with little to no hope of physical representation. It's these subject areas which interest me the most. However, there are very limited real world applications of these subjects, mostly in cryptography. So, it's very likely that I'll be 'giving up' some of my favorite subjects in pursuit of a STEM career. Be that as it may, I hope that the same joy I found plucking away at systems of equations will find me with whatever numbers I end up crunching in the future.

Ralph Waldo Emerson in his essay, Nature, said that "Nature always wears the color of the spirit." In the case of Chris Emmerling, a graduate student studying Chemistry at UMaine-Orono, that meant a coat of curiosity. Chris shares his unique story on how nature influenced his choice to study STEM, while also sharing his noble thoughts on what he wants to do with his degree.

Chris Emmerling

Ph.D. Chemistry Graduate Student

I originally joined college as a freshman biology major, because I grew up hunting and fishing, and I had an interest in the environment surrounding the areas where I was raised. I thought that biology would be an excellent major for me, so that I could obtain a job after college being outdoors all day long. Arkansas is called the "natural state" for a reason; it has a lot of inherent beauty within its borders, just as Maine does. However, upon taking the introductory coursework in biology, I soon learned that my true skill and passion leaned towards chemistry.

Chemistry better suited me for a multitude of reasons. First, I loved drawing molecules on paper. I thoroughly enjoyed geometry in high school (probably part of the reason I like optics, currently), and this skill set translated well for my freshman chemistry courses. I have always liked the challenges that STEM courses bring into the classroom and laboratory. I chose STEM because I want to make a difference in the world, and I have found that difference through instructing students in my introductory chemistry courses. I am hopeful that I can continue to do that as a career for the rest of my working life. Someone has to care about the world's students, and ensure their wellbeing. I also look forward to the freedom that comes with the ability to design experiments for students of all backgrounds, to participate in and learn something from, as they make their way through my class.

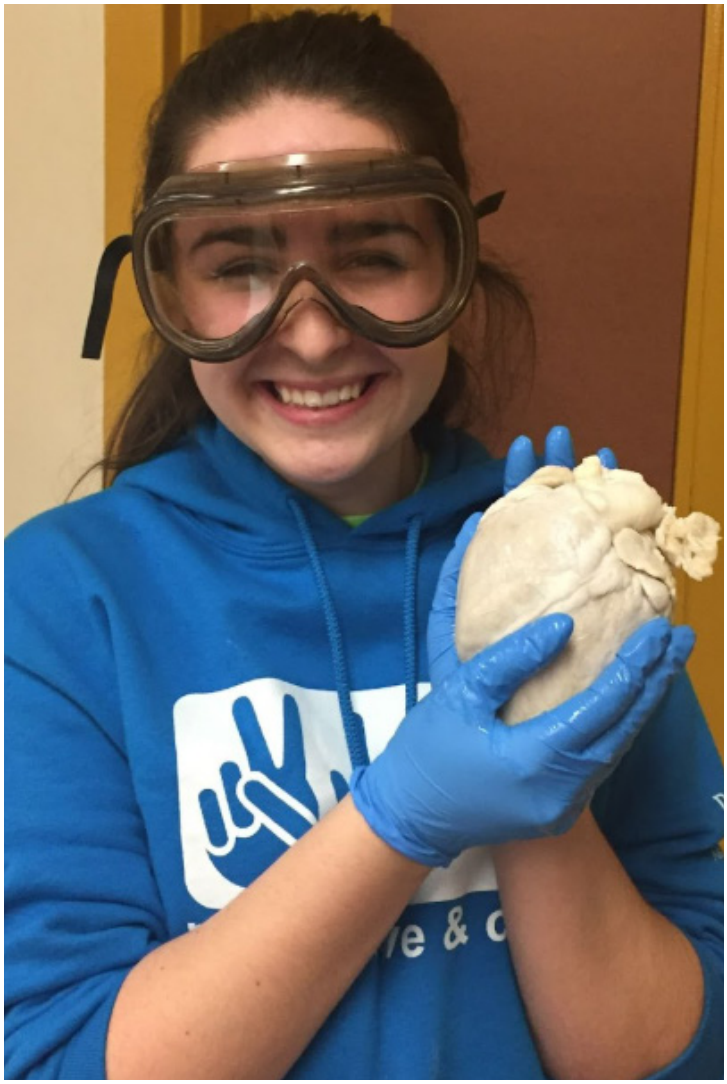
Finally, we have Kailey Bell. Kailey is a Biomedical Engineering student pursuing her Masters degree at UMaine-Orono. She takes us back in time with her engaging anecdote about jerry-rigging a convoluted experiment in her own home. She shares her Thoreouvean method of finding beauty in things, as well as her altruistic tendencies, and how all of that interconnects with her pursuit.

Kailey Bell

Ph.D. Chemistry Graduate Student

My interest in biomedical engineering began with my high school science fair project – I decellularized a deer heart, acquired by a classmate during the Maine hunting season, on the back counter of the chemistry classroom. Decellularization removes all the cellular and genetic material from an organ, leaving behind a scaffolding of extracellular material. The idea is that this structural remnant can be used as a platform for growing patient-specific cells, generating personalized replacement organs that are less likely to trigger immune rejection. Generally, this technique is performed in state-of-the-art research laboratories. As those were hard to come by in my hometown, I used a soup pot borrowed from my health teacher, an aquarium air pump, and various household chemicals and supplements like pineapple and papaya enzymes, which I purchased from WalMart (yes, I got weird looks when cashing out). My results were likely insufficient for the recellularization and reimplantation processes, but it did not matter. I was enamored with the creative problem-solving of biomedical experimentation from then on.

Had you asked me that age-old question, "What do you want to be when you grow up?" before this homespun experiment, my answers would have ranged from ornithologist to marine biologist to teacher to therapist. The younger versions of me would not have recognized it, but the connecting thread of these choices is a reverence for nature, a desire to help others, and childlike curiosity and wonder. I was the little kid always asking, "Why?" and I was the kid constantly catching frogs and bugs in the backyard to examine them. I am, and always have been prone to following my curiosity until it turns into awe. I love looking at something from as many different perspectives as possible until I can marvel at the beauty of how or why something is the way it is. I also am and always have been deeply drawn toward any direction that brings joy and peace to others. Holding that ghost-white cell-stripped organ in my hands was the first time I discovered that biomedical engineering weaves all of that together into an interdisciplinary tapestry of curiosity, creativity, and impactfulness that I love - and I haven't looked back since.



Our thinkers' stories vividly demonstrate that every journey into the realm of STEM is as diverse as the individuals embarking upon it, despite aiming for the same destination. From Kailey's altruistic aspirations to Chris's deep affinity for nature, they illuminate the unique motivations that propel each of the thinkers forward. Within the intricacies of their journeys themselves lies a reservoir of wisdom and inspiration that could be applied to one's own journey. If you're inclined to share your own narrative and ignite the spirits of fellow thinkers in a similar way, we wholeheartedly invite you to submit your stories to **mcec@maine.edu**

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