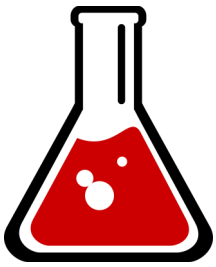
Memorial Sloan Kettering Cancer Center

Volume 1, Issue 1
August 10, 2018

# Charting A Path

## Perspectives and Advice from Summer at MSK students

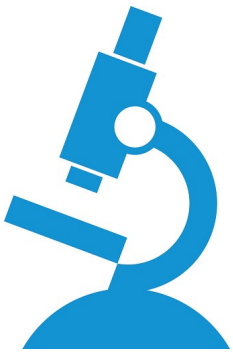


**Chemical Biology Summer Program (ChBSP)**

**Computational Biology Summer Program (CBSP)**

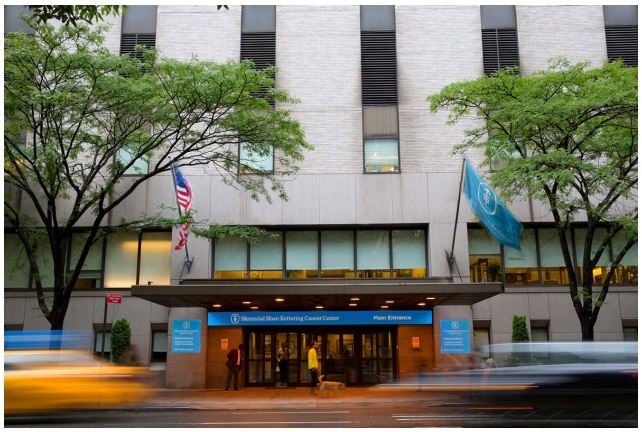
**Molecular Imaging Summer Program (MISP)**

**MSK Engineering Summer Program (MESP)**



Memorial Sloan Kettering Cancer Center





## Inside this issue:

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# Finding Your Niche

Miriam Saffern, MESP

Striding eastward down 68th street, on my way to my volunteer shift at Weill Cornell Medical Center, I would pause in front of the revolving door of the Zuckerman Research Center. I'd peer through the lobby window to observe scientists and physicians discussing their work in the lobby, ready to enter the auditorium for a seminar. My eyes would scan the façade of the glass building, where I imagined cells were being engineered, constructs were being imaged, and experiments were being designed. With the disappointment of rejection from two summer internship application cycles lingering inside of me, I felt like an outsider looking in to a world of which I could not be a part.

Flash-forward to June 2018. I was sitting in ZRC-105 being welcomed into the Summer at MSK program. It felt surreal to be on the inside of the revolving door. I felt the unease of first-day flutters, but with cutting-edge research happening on the floors above me, I believed I was home. Then we were told we were all here because we had a specific skill set that we could bring to the labs that we would be working in. My confidence immediately dropped. In a lab full of accomplished scientists, what could I, a mere undergraduate, contribute? Sure, I had taken many science and engineering courses and I had some research experience, but that felt irrelevant compared to the experience of the researchers at MSK.

During the first couple of weeks in lab, I struggled to find my footing. I would triple-check my calculations, perform my experiments slowly, and would not hesitate to let someone else finish an experiment for me. I would sneak a look at the ID tags of the people on my morning elevator ride and see "Graduate Student," "Associate Member," "Research Technician," or "Attending," feeling mediocre with "Student Temporary" branded on my tag. I did not want my time in the scientific community to be temporary; I hoped that I would gain the expertise and confidence to spend years adding links to the growing chain of scientific discoveries.

I don't think there was one pivotal moment that gave me a sense of belonging, but more so a realization that people trusted in me. My PI gave me the independence to plan experiments that I thought would move the project forward. He listened to my opinions and analyses, which made me feel respected. When the post-doc asked me to take care of her cells one day, I felt trusted. As part of the MSK Summer Student Seminar Series, we had the privilege of hearing from President Craig Thompson in a talk titled *Cancer: The President's Perspective*. At the start of his talk, he personally welcomed us all to MSK. He said that we deserved to be here and that he was looking forward to seeing us back. Dr. Jedd Wolchok similarly said at his seminar *Cancer Immunotherapy: Where We Are and How We Got There* that we deserved to be there and extended an open invitation to meet and talk to him and other scientists at MSK with any comments or questions. If the president of the top cancer center in the nation believed in me, and one of the leading experts in cancer immunotherapy believed in me, then without a doubt I could believe in myself too.

I began to realize that even though I did not yet have years of graduate school or published papers

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# Scientific Frustration: When Things Don't Work

Abigail Ayers, MESP

It's a Friday afternoon. You've spent the last week prepping for your experiment today, and you're glancing between the clock and the computer, drumming your fingers as you wait for your results. Finally, you're finished – but it didn't work. Hours wasted, all for nothing. You groan in frustration. *What am I even doing here?*

Anyone who has spent any time doing research can relate to a scenario like this one. All too often, things don't go as planned when it comes to science. In fact, frustration and science are practically synonymous. The nature of science is that it is inherently unpredictable – if it were predictable, there would be no need for this career path.

> "The nature of science is that it is inherently unpredictable"

The frustration we most often encounter develops when results are not as expected. We may think we have a fantastic idea, but reality often doesn't cooperate. This can be especially nerve-wracking under pressure of deadlines, because science follows its own timeline. The disparity between expectations and actual outcomes is dangerous and drives some researchers to a breaking point, too often leading to bias or falsehoods in results; these contributions are at best, ultimately useless and, at worst, harmful to the scientific community and society.

In addition to more scientific sources of frustration, there are countless other obstacles that emerge in the research process. Clashes with peers, mentors, and PIs are inevitable. Relationships with people in your work environment often matter as much as the data of your research, so when tension plagues your interactions, it can be all the more difficult to get things done. For women and minorities, especially in STEM fields where other demographic groups tend to predominate, prejudice in the workplace can further raise stress and hinder success.

With all of these opportunities to drown in the waters of scientific and professional challenges, how do we stay afloat? The most important thing to remember is that being frustrated is a natural part of the scientific process. My experience has taught me how naïve I was coming into research. Of course, I vaguely knew it would be challenging, but when all I had ever seen was nice data and summaries of research projects after they were completed, I didn't understand the mess and struggle that researchers go through to condense their work into something presentable. So, when I first started doing my own research, I was quickly discouraged by my seeming lack of progress. I thought that I was doing something wrong and was not cut out for this field because everyone else around me seemed to be doing great. In truth, we only see the highlights of what other people are experiencing; everyone encounters difficulties and hits road blocks. Eventually, my work started to come together, and by the end of the project, it looked pretty good, despite my feelings that nothing beneficial was going to come out of it for the majority of the experience.

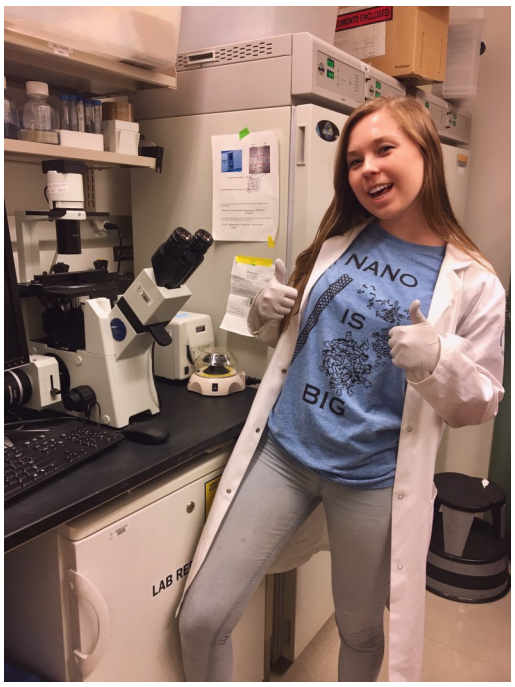
Maybe if we realize that we are not failures for running into problems in our research and that we are not alone in this, we can move forward and choose how to respond to the negative experiences in productive and even rewarding ways. In my first research

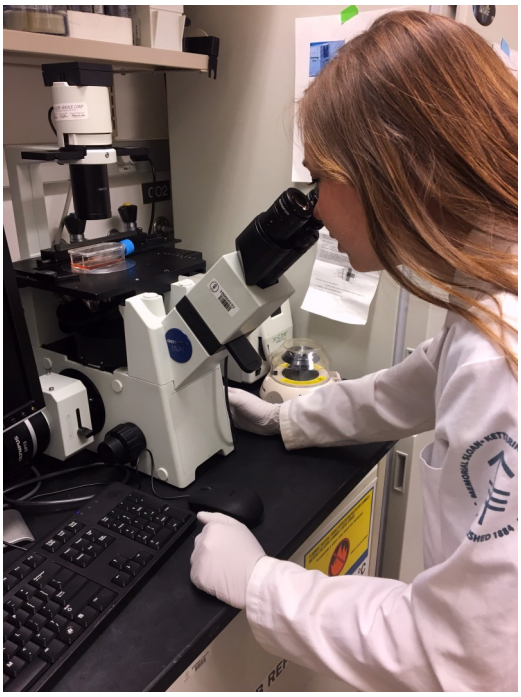
lab when I was stumped by a bad experiment, my PI told me, "negative results are still results." I have found this statement to be the best approach to scientific frustration: everything is a learning experience, and we can still gain valuable information from unexpected outcomes. In terms of the science itself, a disappointing result still tells you something you didn't know before and offers an opportunity to move in a different direction. As importantly, however, these frustrations allow us to learn about ourselves. We may learn what does and doesn't work for us in terms of how we approach a research problem. We learn more about our strengths and weaknesses and train ourselves for handling difficult situations.

Through the ups and downs of my research experiences thus far, I have discovered that a major aspect of what it takes to succeed as a scientist is emotional strength and perseverance, in addition to actual academic intelligence. As scientists, we must not only develop the technical skills that we put on our resumes, but also train ourselves in emotional control, endurance, and hope. We can't shut down when things don't go as planned; those times are when we must shine the most.

Science is about seeking something new and exploring the unknown. We're grasping for something we can't quite see or understand yet, so we're bound to come up empty-handed sometimes – even most of the time. The only thing guaranteed in our work is that things won't go as expected. Therefore, it is those who have the determination to keep trying that are able to succeed. Often, scientific discoveries aren't as much the product of a genius mind far above the others, but come from someone who has the stamina to wade through all of the "no's" before they get a "yes". ●

> "Science is about seeking something new and exploring the unknown."



# Engineering and Medicine: Three FAQ's

Darren Lin, MESP

**How can an Engineering degree be applied in laboratory work?**

**What are the options for graduate school after an Engineering degree?**

**How does the work environment differ in academic research as compared to industry?**

These were just some of the questions I had when I began working at MSK. I was a rising third-year Mechanical Engineering student at the City College of New York, and this was the first time I've worked at a lab.

My project was an investigation into the effect of substrate stiffness on a breast cancer cell line. I would plate cells on soft dishes, photograph them, and analyze their metabolites. Being that I had never taken a college biology course, I had to learn almost everything on the job: cell culture, protein assays, lab protocols, etc. It was all new to me, and as the summer progressed, I slowly started to find the answers to my questions.

**How can an Engineering degree be applied in laboratory work?**

The Kayvan Keshari lab specializes in imaging technologies - specifically MRI and NMR. My postdoctoral mentor was a biophysicist, and several of the scientists came from electrical engineering backgrounds.

One of the first things I noticed in the lab was how much MATLAB was used. I'd just taken a MATLAB course this past semester, so it was super exciting to see it in action. We used MATLAB to process data and images, and it was the scientists with the engineering backgrounds who worked with it the most, writing functions for the rest of the lab to use.

Coming into the lab, I didn't know what to really expect from an engineering standpoint. Was there design? Was there biochemistry? Turns out, there was a good balance of both. My mentor was building a high-sensitivity microscope, and another scientist was working on a bioreactor. Our 3D printer was being used almost every day, and the soldering iron was never cold for too long.

**What are the options for graduate school after an Engineering degree?**

In theory, an engineering undergraduate can pursue any graduate degree they like - business, law, science, more engineering, etc. I knew this coming into the program. But now, at the end of my summer, I have a clearer insight into all the doors they can open.

I used to (wrongly) believe that one had to get a Master's before they get a PhD, and that both cost a lot of money. You do need to pay for a Master's, but you will be *paid* to get a PhD. You'll only earn slightly more than a McDonald's employee, but definitely enough to cover your basic living expenses.

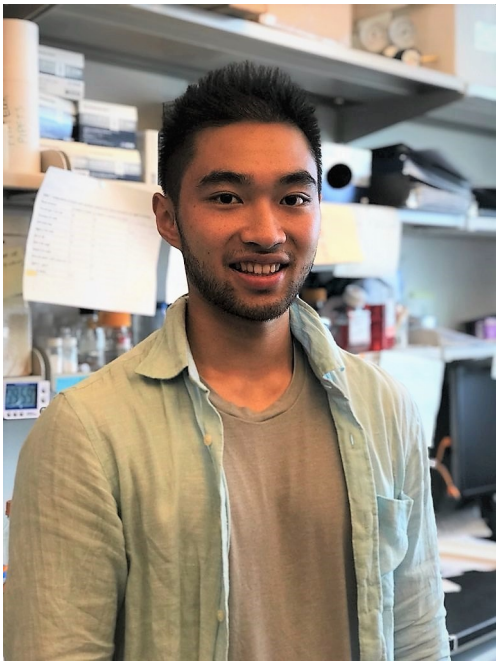
A PhD, especially in science, takes a long time. From what some scientists told me, one should pursue a

PhD if they like to be in academia. That means research, teaching, making discoveries and publishing them. For someone who hadn't really considered a PhD, this gave me something to ponder: is research something that I'd like to do in the long term?

**How does the work environment differ in academic research compared to industry?**

Working as a research intern full time this summer was, least to say, different from the other internships I've done. The lab is open 24/7, you can take breaks whenever you want, and there is no hard 9-5 schedule. As long as you're managing your time well and performing your experiments, you can technically come in (or leave) anytime. Scientists come in at 9 PM occasionally, some work a bit on weekends, and everyone loves to grab a coffee in the lounge.

At this stage in my life, I'm really trying to explore my interests and find a passion. In addition to talking to the people in my lab, I tried talking with MSK employees in other departments - Facilities Design + Construction and the Nanomedicine Laboratory, to name a couple. These conversations not only helped



me get a sense of what healthcare careers are like, but also improved my communication skills.

Your summer at MSK is what you make of it: The resources, the seminars, the people. Everyone is there to help, and the more people you talk to, the more you'll leave with at the end of the summer.

*"Finding Your Niche," continued from page 3*

under my belt, I still had something to contribute. Even when I am missing a technique or a piece of background knowledge that I need for an experiment, I have the educational and field experience to easily learn and apply it. Moreover, as budding scientists, growing up in a new age from diverse backgrounds, we each have unique perspectives and ideas that will form the future of science.

Once, when I was walking to the hospital cafeteria, I passed by a wall monitor that displayed pictures of cancer warriors and messages in memoriam. I stopped short when I saw a family with tear-stained cheeks, posing for one last family photo next to the wall as a smiling young boy flashed onto the screen. My heart skipped a beat as I realized that families like these trust in me too. Through this, I have learned to believe in myself, even at times when I think that I am my only cheerleader. And that has given me the confidence to continue in my scientific pursuits, because every contribution counts.

# Reflections on Journal Club

## Vivian Huang, MISP

When the first journal club session took place back in June, I was nervous. We had attended a seminar called "How to Read & Present A Scientific Manuscript" the week before, and the lecturer had mentioned briefly how journal clubs run. Although it was helpful in providing guidance on how we should approach a piece of literature, the lecture did little to ease my nerves.

How was I supposed to understand a scientific article enough to formulate an educated opinion on a topic that I barely knew anything about?

It was my first journal club ever, and I had no idea what to expect. Having received our first two articles the week before, I was feeling less than confident. Sure, I read the articles. But did I feel prepared to discuss the contents of the article? Not at all. No matter how many phrases I underlined or notes I wrote in the margins, my brain did not seem capable of absorbing anything substantial for a discussion.

I nervously walked into room 21-70 on that Tuesday morning, clutching the two articles that I had tried to review on the subway ride to MSK. The moderator was very welcoming and tried to strike up conversation with everyone as they slowly trickled in. Journal club started a few minutes later. To my relief, the moderator had a PowerPoint for us to follow along, listing different points that we should keep an eye out for as we read the article: What is the purpose of this experiment? Did the authors effectively summarize their findings?

Most of the session, however, was spent looking over the tables and figures of the results section, figuring out what each image was trying to depict.

By the end of the hour, I was feeling better about how journal clubs ran. We did not solely focus on the small details embedded throughout the article, except for some basic background information we needed. Instead, we understood the general ideas the article discussed and focused on what each figure conveyed in relation to the authors' conclusions.

The following few journal club sessions were very similar, with the moderators focusing more on the figures and tables rather than the information in the introduction, methods, and discussion sections. Over time, I also found these assigned articles easier to read, as I knew which sections I needed to focus on and which I could skim for basic information. These journal clubs taught me new ways of approaching what once was a very intimidating piece of literature and how to critically think about the ideas presented in the article. It also gave us all a chance to gain exposure to slightly different fields that involved molecular imaging, such as nuclear medicine and developmental biology.

> "Journal clubs taught me new ways of approaching what once was a very intimidating piece of literature"

It will still take me a lot more time to get used to journal clubs and reading scientific literature in general, but these few sessions this summer so far have really set the bar for what is expected when we are told to read an article. It is just as many researchers have said so far this summer, "Images speak louder than words."

# Advice from Tom Magaldi: Career Paths After Undergrad

## Kristin Ludwicki, MESP

It is ironic that as toddlers we have very clear dreams, but that we seem to waiver in choosing a career path after college. With an abundance of career options in addition to external pressures and financial concerns, making a choice is not easy. Seeking guidance from parents or advisors is important, but listening to your heart is truly what matters most. Taking a step back to self-reflect and set up a time to casually talk to professionals are two main keys that could be the turning point towards choosing a clear career path. In Tom Magaldi's talk, "What Can You Be With a STEM Degree," he provided the Summer at MSK students with some advice on choosing a career path.

Through networking, one is able to put themselves in the position of a professional and ask questions that will help determine if one would like to pursue that career. Whether it is searching online for interesting jobs or seeking out someone you know in the field, setting up a professional interview starts with an email. If someone is busy with a demanding work-life schedule, it might be hard to get a response; therefore, research and creativity can get you that reply you have been waiting for. The first key to a successful email is nailing the subject line. This can be done by highlighting uncommon commonalities like the school you attended or a shared interest in a specific sport. It is also beneficial to carry this uncommon commonality throughout your email to show that you not only did your homework, but more importantly, to get them interested in you. While you might be excited about your common interest, stay specific and concise to respect their time. Lastly, be sure to express gratitude and display positivity, and send updates to keep the connection strong. Each connection, even those within the same field, will be able to share a unique perspective that will contribute to your decision, whether it be personal or professional. Take the opportunities to speak with people and build those networks because it will not only help shape your path, but it could also be a point of contact when you are looking for a job in the future.

> **"Take the opportunities to speak with people and build those networks"**

Taking note of strengths and weakness during classes or internships could also help guide you towards or steer you away from a particular career that you might be considering. For example, if you are majoring in biology with plans to go to medical

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# Careers: Building a Future

Naedum DomNwachukwu, MESP

The Scientific Education & Training Department of Memorial Sloan Kettering Cancer Center organized four combined summer internship programs to offer college students from around the world an opportunity to experience translational research in the United States. Under the direction of Dr. Ushma Neil, students in the Chemical Biology, Molecular Imaging, Engineering, and Computational Biology Summer Programs (ChBSP, MISP, MESP, CBSP) worked side-by-side with research scientists for ten weeks. With guidance from medical doctors, professors, and principal investigators, we were exposed to a variety of career paths, professional options, and ways of thinking to help us envision and build our futures. In this article, I will summarize a lecture we attended on the endless possibilities associated with STEM degrees, discuss the career paths that STEM students can pursue, and review advice on how young scientists can begin building their futures.

**What Can You Be With a STEM Degree?**

There are four major degrees associated with common careers in the STEM field: the Bachelor's Degree, the Master's Degree, the Doctoral Degree, and the Medical Degree. These degrees can be combined in a variety of ways and there are also numerous specialties and unconventional degree options, including the M.B.A., J.D., and M.D./Ph.D., that facilitate STEM-related careers.

At the start of our summer program, we attended a lecture by Dr. Thomas Magaldi, in which he provided a very simple but largely true answer to the question of this section: "What can you be with a STEM degree?...Anything!"

According to Dr. Magaldi, a STEM degree provides opportunities in relatively every industry. There are the more traditional routes; you can become a doctor, research scientist, or professor. But there are also alternative options, such as patent law, pharmaceuticals, biotechnology engineering, and financial consulting for tech firms. He claims that the principle difficulty when deciding a future path is not a lack of options but, rather, an excess. In today's world, there are many ways to put a degree to use, despite social pressures from television, social media, instructors, and peers that push us toward the traditional and easily recognizable options. Dr. Magaldi's answer to the topical question rings true. You can be anything with a STEM degree; the limiting factor is you.

> **"What can you be with a STEM degree?...Anything!"**
>
> **~Dr. Thomas Magaldi**

What do you like? What are you good at? What are you passionate about? How can you use your skills to address your passions in a way that makes you happy? Questions like these should drive your decision-making process as you plan your career. Dr. Magaldi stressed this when he shared two opposing methods of job searching.

Method 1 involves searching for jobs online, at career fairs, through public ads, etc. and then applying based on your current skills and abilities, and hoping to get hired. This is a "flawed protocol". It leaves you as just another applicant in a pile; you don't stand out, and you might not be the best fit.

Method 2 involves performing an honest self-assessment to identify your current strengths and qualifications. Only then should you begin to explore jobs. Identify the ones that best align with your Interests and put your skills and abilities to use. With specific positions in mind, get any additional training

# The Future

you need, then apply to the jobs, for which you are now a perfect fit.

There are many widely used self-assessment methods on the market, such as *Strengths Finder 2.0* by Gallup, that can help you identify skills and interests. However, your complete self-assessment should factor in your skills, interests, values, and market. Skills are your technical/analytical and soft/intrapersonal capabilities. Interests are the things you like to do (you should also account for what you dislike doing). Your values are largely self-determined; they are the things you believe are important (family, love, health, religion, travel, etc.). Lastly, your market is an external factor you determine using your job search: where are people like you needed?

Different degrees qualify you for different positions.

**B.S.; B.A.; B.E.**

The Bachelor's Degree, which can be in Science (B.S.), Art (B.A.), Engineering (B.E.), etc., is typically granted after 4 years of undergraduate study and qualifies you for most entry level positions, as well as admission to graduate/professional schools. According to burning glass, a Bachelor's Degree from a STEM program gave graduates an average salary of $66,123 in 2017.

**M.S.; M.B.A.**

The Master's Degree is a graduate-level degree that typically requires 1-2 years to attain. Master's programs can be research focused, in which case they will typically have a thesis defense requirement, or non-research focused. This degree mostly provides the practical and directly applicable high-level skills needed to operate as a manager, overseer, or higher-level employee in industry positions and research labs.

**Ph.D.**

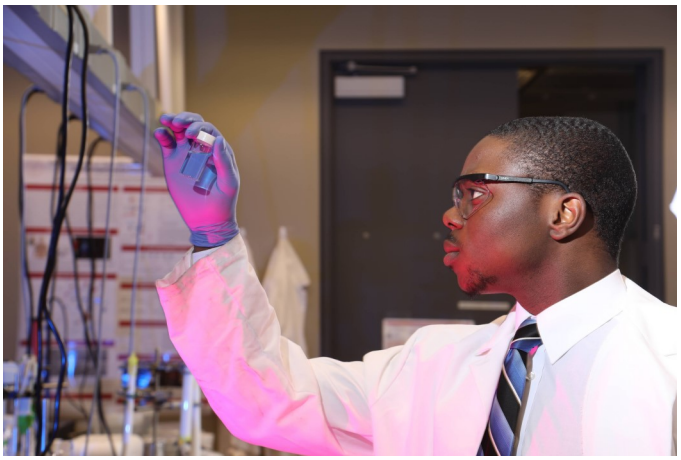
he Ph.D. (Doctor of Philosophy Degree) is the highest graduate-level research degree possible. A doctoral candidate must complete a research dissertation and defend their work before a committee of doctors specializing in and outside of their field. These programs are usually 5-6 years depending on institution, field, research group, and a variety of other factors. Obtaining a Ph.D. would qualify you for university faculty positions, managerial and executive positions in industry, research positions, and any other position where you can put your skills to use.

**M.D.**

The Medical Degree, with board approval, qualifies you to practice medicine. There are various specialties in the medical field and many ways to practice, ranging from diagnostics to surgery.

**M.D./Ph.D.; J.D.**

The M.D./Ph.D. and J.D. are unconventional degree paths for STEM majors. The M.D./Ph.D. produces medical doctors with research skills, researchers with a special insight into medicine, or anything else one can imagine for a highly trained scientist with a vast understanding of the human body and disease. These are usually 8-year programs, typically involving 4 years of medical training and 4 years of doctoral study. The J.D. is the traditional law degree awarded after 3 years in a law program. STEM majors might pursue this education to work in patent law, corporate law, government, or any other social sphere where there is need for people with qualifications in law and a strong understanding of science.



# The Future

**Pave Your Path**

If there is a theme associated with this article, the above section expressed it: you can be anything with a STEM degree. The list and combinations of degrees provided above is not comprehensive. There are many ways to put a science background to work and many programs that can uniquely qualify you for very specific or broad fields. You should not feel pressured to select a traditional path or overwhelmed by the plethora of alternative possibilities. Rather, refer back to Dr. Magaldi's method. To figure out what you should do, first look at yourself. What are you great at? What can you do? This can mean using a self-assessment test or even asking your friends and family what they think your strengths are. Allow yourself to explore different jobs across fields. Identify the careers that interest you, where you can apply your skills, and figure out if you need any extra development. If so, go out and do it. Invest in yourself first if you want others to invest in you. Once all this is done, apply.

**Build Your Future**

Not many people know exactly what they want to do while they are in their undergraduate programs. A common story told by the various professors, doctors, and professionals that I have encountered at Sloan Kettering is that they had no clue what their futures would look like when they were in college. Many of them took round-about paths to arrive in the labs where they work today. Some of them still don't know exactly what tomorrow will bring. However, all of them tried something. They didn't wait for life to happen to them; they looked at the skills they had and found a way to put at least some (not always all) of them to use.

Here are some recommendations we received. First, be open to suggestions because you don't know where your next great idea will come from. Second, seek advice from knowledgeable people. You can't get a lot of information about what a biomedical engineering career at a prosthetics company would be like by talking to your peers. Instead, try to meet with a professional in that field and ask them about their experiences. Third, look for opportunities. College offers a four-year window to safely dip your toes into various fields to see how much you might like them. Take advantage of this and apply to summer programs, shadow professionals, do research, and seek to learn. Last, build a network.

The world operates in networks. One phrase I heard during this program is: "your network is your net worth." This phrase can be taken several ways. For starters, it means that you will likely end up in a similar life situation as the people that you surround yourself with. Although that idea may not be based on empirical science, it suggests that we should surround ourselves with people that exhibit characteristics we admire and want to emulate. The phrase also indicates that many of the opportunities you will have access to will come from people in your network. For example, a mentor could recommend you for a position, a friend could inform you of an opening at a firm, or a former colleague could invite you to work with him/her at a startup. For me, this phrase means that, in building your future, it is critically important that you value your friends and the people who have invested in you. It is important to build real and lasting relationships with colleagues, bosses, mentors, and teachers because people need people. Your people will be best equipped to help you identify your valuable strengths and potential. But this goes beyond building a career; it's about building a life. The people we surround ourselves with will directly affect the value and meaning of the experiences we have and will impact our lives immeasurably.

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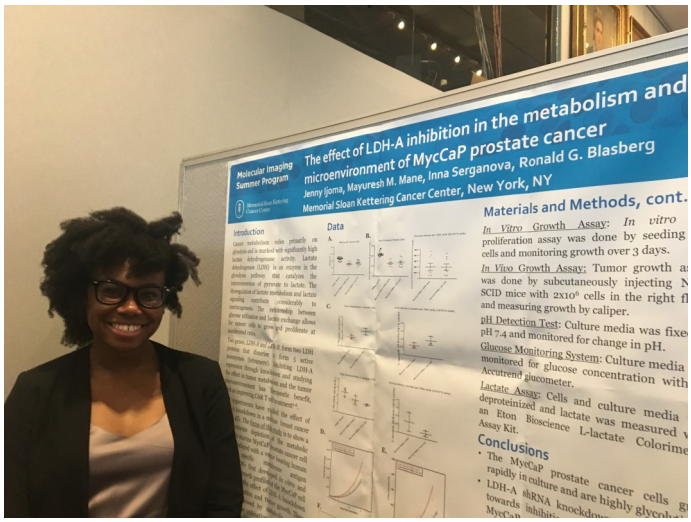
*"Career Paths After Undergrad,: continued from page 9*

school, but do not like working directly with others, becoming a doctor might not be the best plan. On the other hand, personal values and location preference are important to one's well-being and are just as critical to consider. With a dream to study astronomy and a desire to live on the east coast, finding a job market with such limiting criteria might not be realistic. Family, relationships, financial goals, and hobbies differ for everyone, but are important to pay attention to when choosing a life plan that is fitting for you. Self-assessments are extremely beneficial in choosing a career path, and guided books such as *The Start-Up Of You* and *What Color is Your Parachute* can help provide insight because they ask questions you might not have thought to ask yourself.

Keep these points in mind but do not be afraid to embrace your inner toddler. Decisions made without the obstacle of pressure and with personal values in mind are always the best ones. No one ever regrets choosing a job they love and that starts by listening to yourself.

# Photo Corner





*Top left*: Jenny Ijoma, MISP, at the end-of-summer poster session

*Bottom left*: From left to right: MISP students Jack Berry, Kiara Cruickshank, Veer Shah, and friend explore NYC

*Top right*: Ana Berthel, CBSP