**Q&A panel transcript with Claire, Sam, and Yutong**

*Claire Kampman is a Class of ’17 Biology alumnus. During her time on campus, Claire was an Uplift leader, TA’d for three biology labs, and did research in the Vaughan lab. She participated in summer internships at Case Western Reserve University and Abeona therapeutics as an undergraduate. She now works as a Regulatory Affairs Associate at Abeona Therapeutics, communicating with the FDA and strategizing approval pathways for drug products in development.*

*Samantha Golomb earned a BS in Microbiology from The Ohio State University and worked as a Process Development Associate at Bayer Pharmaceuticals for three years. At Bayer, she worked on protein purification process development for biological drugs entering phase 1 through 3 clinical trials. While working in industry, she realized her interests in drug discovery and studying cancer therapeutics. She is now a first-year graduate student in the department of Biological Sciences in Dr. Siyuan Zhang's lab in the Harper Cancer Research Institute, studying gut microbiome-brain communication in the context of cancer. Upon graduation, she plans to return to the industry setting while continuing to study cancer therapy.*

*Yutong Liu is a senior biology undergraduate student with a strong interest in global health. During his time at Notre Dame, he has worked on several projects on issues such as palliative care and lead poisoning, working with key stakeholders in the community in each case. This developed his interest in interacting with the biomedical industry and the business side of health. Following graduation in May 2019, he will begin working as a Health Care Analytics & Delivery Fellow with McKinsey & Co. in Chicago. Through this job, he hopes to gain more industry experience and continue his own personal pursuits in improving community health, possibly by earning a higher degree or via transition to another organization.*

**What skills did you develop in college that helped you pursue your careers?**

CLAIRE: For me, I was extremely proficient at reading and dissecting literature. That helped a lot for my role. I had good communication skills from my extracurricular jobs as well.

SAM: I did internships at Bayer group before I graduated, but I wasn’t necessarily planning on going back. After graduation. I applied to various companies and Bayer was the one that worked out. I think it definitely helped having a foot in the door. From my experience at the company, I already had some of the skills they were looking. I think communication skills and clear examples of being able to show you can work in a team is really desirable. There are so many opportunities you can use to show that. You don’t have to tell them that you worked in a research lab with a group of people to say that you have teamwork skills. I was a student athlete at Ohio State, so I really milked that to give me the experience. I didn’t have much of a science background at all because I was just too busy with my athletics and school So try to think about all your skills. If at first it doesn’t seem like its directly related to the job, there are usually ways you can tailor different skills to meet what they’re for.

YUTONG: For me, I didn’t do an internship a company so it’s not a traditional route that I have taken. But I think exactly what is being said is that the experiences that you have as an undergraduate student, the projects you've led, research you've done, or even student organization you've participated with and had a leadership position in - that is what they're trying to look for. The ability to lead a team and work with other people. I remember during my interviews there were a lot of questions like, "tell me about a time you resolved a conflict between you and a team member" or “tell me about a time you resolved a conflict between your team and other people”. The examples I talked about were not necessarily industry or business related. I talked about teaching with TakeTen, a nonviolent conflict resolution course for high school students here in South Bend. I think that really stood out to them, seeing how I can lead a team of students to go into a high school and engage with kids that have totally different socioeconomic backgrounds from myself and the people whom I'm leading and try to engage them in a profound way. I think it’s good to have experience in internships and also its not necessarily true that you have to plan your undergraduate career step by step. I think you should just be reflective of what you've been doing and really engage with them.

**Can you speak about the difference between working in Academia and Industry?**

SAM: To me the biggest difference is money. For example, you have a lot more funding at biotech companies, more so the large ones. Then things like company structure, size of the company and how compartmentalized your role is. At a big company, the more people, the more “set” your job is, which usually means less creativity. It’s very different for sure.

**For CLAIRE,** **can you explain what clinical operators and process development are?**

Drug development, from what I know, can be divided into two paths. There is a research side and the development size, or late stage size. Process development sort of falls in the beginning of the late stage size, after the drug or certain targets has been discovered. All drugs go through a series of stages, like D1, D2, D3, before anything gets to clinical trials. Process development is kind of the in-between after research and clinical trials. For example, I was working with on a project for protein purification process development. Our stages were separated by stages such as cell culture fermentation, protein purification and final formulation, and then how to formulate the drug ready for injection. Process development is literally developing the best most streamlined process for how to make it at large scale for clinical trial and eventually maybe global manufacture. Next is clinical manufacturing, and then from there it gets passed on, depending on like approvals, to commercial. We usually pass it on to like the commercial level group or another facility.

**Follow up, can you describe your work with protein purification? Do you do bench work before taking to clinical trials?**

CLAIRE: That’s a good question. It can be both, it depends on how your group is set up. Within our protein purification development group, we were split into two teams. One team would do a lot of the benchwork when we get a new project. They do some of the dirty work like how to really get a good process. The other team I think of as the clinical team, they’re more focused on the scale-up part. Both still teams worked closely together and there was still overlap and intermixing. So depending on how its structured in the company you can get a little bit of both.

**How many people in your work had a background in science?**

CLAIRE: At my company, it is a pretty even mix. A lot of the new manufacturing hires have an undergraduate degree in science. The product development team, or the research side, either have masters or PhD. My team is half and half for bachelor’s degrees and PhDs. I would say it’s pretty even. It probably depends on the team though.

SAM: Where I was it was similar. All of the entry level employees had bachelor degrees and usually had a background in some kind of biology, biochemistry, or chemical engineering. Any management level position had a PhD. There is kind of this weird shift where some managers on the older end who snuck into high level positions, and I think it has to do with like the culture. First, everyone had a high school degree, now everyone has a bachelor’s degree, next everyone is getting a PhD. I think that probably the same with the research side, a lot of them have PhDs.

YUTONG: For consulting, most of the work force that is hired at the business analyst and kind of associate level are undergraduate, graduate, MBA students or MBS students. There are not a lot of PhD people who end up in consulting. I knew someone at McKinsey & Company and had a PhD in biomedical engineering He had decided he did not want to do medical engineering anymore and he went into business consulting. Generally, I think that a lot, undergraduate and master’s students who do not hold a graduate degree, use consulting as like a starting point or jumping board to something much more. A lot of them end up getting a higher degree later after consulting for a couple years or go into another industry.

**What does a consultant do?**

If you’re a cynic then you'll say consultants are a group of people who do not know anything, come into your firm, and tell you what to do, right? But basically, consultancy means renting out brains and people. People and teams who are skilled in resolving problems. Resolving problems like making up the capacity that client does not have. For example, in healthcare analytics, you could have a client who is a healthcare provider, a hospital, and they want to upgrade their system, so they have a digital patient management system. Maybe they want to streamline their way of scheduling operations, but they don’t have the capacity to do it. They don’t have dedicated staff or department to do it, or they just have no idea how to even start. So, they'll have teams of consultants from firms and what they'll do is they'll collect data, learn the facts, talk to agents, talk to doctors, get data from the client if they have data collection. If they don’t have good data collection we might need to collect our own data. Then its analyzing the data in order to identify strategic steps to take to achieve the client’s goal. If a biotech company wants to go int a new field of medicine, do they want to develop this internally? or do we want to acquire a small new company who already has the patents capacity to do this. If we do want to acquire one, which one do we acquire? That kind of strategizing and analyzing is basically what consultancy is. Now there is traditionally not a lot implementation, which is taken into the hands of the clients themselves. But there has been a growing trend of having some at least initial implementation done for the client.

**How has your work experience affected any plans to pursue an advanced degree?**

CLAIRE: I was actually really nervous applying to grad school because I didn’t have actually any research experience. I didn’t do undergraduate research and the only research experience I had was my job. I knew a ton about protein purification and chromatography, but it wasn’t closely related to what I originally wanted to study in grad school. I wanted to do something with either molecular biology, infectious disease, or cancer. I think in the end, it doesn’t matter so much what you study. The experience of going to a job 9 to 5 and having the mindset that you're here to work is what I think a lot of professors look for in students. They want to you know what its like to come in, dedicate yourself to a project, and meet a deadline. In that time before graduate school, even if you aren’t working somewhere you get those technical research skills, you’re learning valuable skills like how to do a project or work with other people. I think for me I really went to sell that part of it because I couldn't say that I have the technical skills for what I'm researching today. I should have felt more confident in that because it is valuable, and you don’t necessarily get that experience while you're in your undergrad. A lot of people do a direct transition from undergraduate to graduate school, but I think it helps to learn how to prioritize research over classes. Classes are obviously important, but research needs to come first. It’s not the type of thing where you can go, “Oh I have class in the morning and then maybe ill go to the gym and then go to lab tomorrow when I don’t have class". You need to treat it as a job. I think having work experience is really valuable just for that mindset, and it doesn't have to be about exactly what you’ve researched or what technical skills you have.

SAM: For me I think I want to stay in something very “translational”. I am going to target labs that are looking into a specific therapy and are trying to translate them to another disease group. Or find developments that are just about to be translated into therapy. I would definitely entertain staying in gene therapy for a PhD but otherwise I haven’t given too much additional thought.

**Are you approaching grad school in a different way who are just coming straight in like do you recommend doing that before you go into grad school?**

CLAIRE: I recommend getting a job first if you're not sure if you want to do grad school. I had been thinking about it in undergrad, but by the time I was a senior I still really didn’t know. My professors at the time were like, “if you don't know, then just take some time to get some experience so you can figure out what you do like". I think that was really big for me. Even though I like my job, it also helped me figure out what I like and don't like. Grad school is a big decision. it’s a big chunk of your time and a big commitment. I think for me it really helped, aside from just figuring out what type of research I’m interested in, or what type of career goals I had; it helped me understand the real purpose of grad school. I used to think it was getting specialized in a certain topic, that if you get a PhD in cancer then you are a specialist in this type of cancer or something. But Now I think of it like training, in becoming a real scientist and being able to independently do whatever your project is, or work at a company, or be a professor/ I needed like my work time to understand that.

**How would you respond to comments that say going into industry is all about the money?**

CLAIRE: I’m not going to lie, money is a big part of it. Stakeholders will respond to each decision we (as a company) make and that can be frustrating at times. But the reality of the situation is that you need money to help patients. You need money to develop the drug. Earlier I hope I was able to convey that at our company we are extremely patient focused, and that’s really gratifying. I know at least that our company mission is still aligned to the patients and not to the money.

SAM: I think being at a company it’s easier to be closer to the patients. If you're in academia its usually such an early stage of drug development that the connection to the patient is a lot murkier. Even though there’s money like involved. Even at a big company like Bayer they were really into patient advocacy, like bringing patients onsite. I don’t think you really get to see that in academia unless you really go out of your way personally to go participate in those things.

**Do you think you will return to industry after graduate school?**

CLAIRE: As of now, just like 6 months into my PhD, I will. I think I had this initial experience so I kind of know what it’s like. I’ve never really seen myself as a PI or professor. Over the course of the next five years that could change but my goal is to be back in industry. I want to be more in the research side rather than late stage drug development.