

David Lloyd Interview

What year did Calgary iGEM come up with the biosensor idea that ultimately resulted in FREDsense?

Sure, I'll give you a little bit of the background of where we came from. My personal background with it is that I was involved in iGEM when I was doing my undergraduate degree at the University of Alberta for a couple of years. I graduated that degree and came down to the University of Calgary to do my Masters [degree] and ended up getting involved with the iGEM team there. That was in 2011. At that time we were a team of just about little less than 10 undergraduate students, a couple of mentors, myself, and a couple of other graduate students were supporting on the team. We came up with this idea of essentially trying to solve a major challenge in the oil and gas industry. We were able to get some funding from a group at the time who sponsored us looking at some of the toxic components found in tailing ponds -those big pools of contaminated water that were found after the oil extraction process happened- and we had thought about using this idea of a biosensor. Getting bacteria to sense some of those compounds and report them to you electrically, using an electrochemical system as opposed to light or colour change. We had done some of that and showed it worked, did well at the competition in 2011, and decided that we really wanted to come back and continue working on this project this idea of using a biosensor in 2012. So we developed a big team, we had 30 people, we were actively working on the technology for that summer. We raised a bunch of money, and we'd really been able to develop this idea of the biosensor significantly further than where we were the year before. At iGEM we were able to win more awards than any other team had since the competition started in 2003... so really successful competition year for us. We were really developing something that really got a lot of traction with some of the judges so that was sort of our initial technical development that led to us founding FREDsense.

When you were designing FREDsense, originally were you designing it to be marketable?

I think a big part of iGEM competition is to show that the ideas and the synthetic biology solution that your developing have an application to society. I don't think it was necessarily from the viewpoint of designing a system to be able to create a revenue, or economic value per se for the lense of what we were doing, from the start up companies perspective, but we were certainly looking at the value that was being created for the customer. In this case for the oil and gas industry. We were very much focused on developing solutions that would fit into what operators were using and how their specific requirements would effect the type of design choices that we need to make. I think we were all a little surprised that we decided to start a company from the perspective of we didn't set out at the beginning to go and start a company, it was something we decided to do once we recognized there was some commercial value in what we developed.

After the jamboree, did you have any problems balancing IP issues? Did you have IP issues?

Haha YES. We certainly did. There's a few different layers of that which made it quite complicated. One was that we had submitted our ideas to an open source competition, we had made publicly available the IP through our wiki, so there was some knowledge out already for what it was that we were developing so that was a risk. The second was that we were a team of 30 individuals that had developed the technology, and we were only a team of 6 that wanted to pursue the company. There was this contribution that was made by many other individuals on the team. The third part was that because we had used U of C resources, the university also had some rights to the IP that was developed. All three of

those requirements were challenges that we had encountered that we needed to overcome in order to continue developing the company.

Did it take you a long time to figure it out?

We were really fortunate that we were able to get some fantastic legal council and support for how to tackle each of these [challenges]. Some took longer than others. The challenge with disclosure at the iGEM competition was something that was easier to tackle because we were able to patent our technology prior to it going open source. The US Patent Office can file a patent within one year of disclosure. So if you disclose something out into the community you have sort of put a line in the sand for a one year period by which you can go to the patent office. We were able to patent our technology within that period of time. Also through some legal council we were able to track down all 30 individuals that were part of the team and essentially just got them to sign some documentation to show they didn't have an interest in what we were developing and that they were alright with us continuing to develop IP and would sign their rights to us so that was something we were able to do. The most difficult process, it actually took two years to completely finalize, was getting the University of Calgary to a place where we could essentially determine what their stake was going to be in the IP that we had developed. It was actually the most challenging of those three areas we had to move through.

Do you have any advice for young entrepreneurs on how to get the initial idea to product stage.

Yeah, so when it comes to IP side of things I think the really important thing to consider is to make sure you know what your rights are, and know what your obligations to your university are going to be if you do develop something out of your graduate degree, out of your undergrad, your iGEM, whatever it might be. Just understand what those implications could be for you because I think we very much went into this with out thinking about that. And every university is different. Yeah that's really the biggest thing I'd recommend on the IP side.

Any other advice, in general from getting to product stage from initial idea?

Yeah, I think there's a bunch of things, and they all sort of vary depending on what your product is, the market you're looking at. Some of the things that are most important are if you have an idea, the first I'd recommend doing is to really try and validate its usefulness and the problem it solves with the potential customer. Try and find a group that would be willing to use your solution so that you can learn essentially what it is that the real solution to the problem their experiencing would be, and is it the problem you imagined? I think it's incredibly useful to go and validate that the assumptions you have around your idea are actually true. If your imagining an oil field worker would use your tech, like we were, to monitor contaminates is that actually something they'd find value in. Picking up the phone and having those conversations is extremely important. It was through that process that we actually found out the initial sensor we were building didn't have value for the oil and gas industry and we ended up changing the sensor we were building to look at other market opportunities, more in the utility space. Spend you time really figuring out what the value your product is going to provide to that customer base.

Our project focuses on Nova Scotia, because forestry industry here is so big, would you be okay if I passed you off to Mackenzie, our project leads, she has a couple questions more based around our project.

Sure!

[Mackenzie gives a run down of our project]

How would we go about communicating with the lumber industry for product design, you just mentioned it's really important that the industry your designing for needs the thing your designing. Would you just suggest reaching out via email first?

Absolutely, that's a great way to get connected with some of these groups. I would certainly say email, look on the website of the relevant companies, find individuals you that you think would utilize this innovation, or maybe have some kind of involvement in a purchase decision, or utilizing it, or making some kind of strategic decision in how the technology could be adopted into what they're doing. Also don't be afraid to pick up the phone and call them, you can play the student card and say "hey I'm working on this project, I just want to pick your brain for 15-20 minutes" I think you'll find they'll be quite open in giving you some of their time. Use those calls as a means of discovery. Just try to understand what do they do with that waste. How does that effect their bottom line, the money they bring into their organizations. What are their major challenges, how does that work? Reach out directly, build up some of those conversations to learn more about how they're doing things in their process. The second thing I'd recommend is reaching out to industry associations or industry groups that may have connections into the community, or have some sort of mission that's aligned with what you're doing. I'm not sure if there are groups in the Nova Scotia area that represent the industry or maybe are lobbying groups that have issues with some of the waste that's being produced. Those are usually individuals with years of experiences in those industry associations that will be really able to direct you into the community and provide some insight to who you might want to be talking to and where the value would be. Again, email or phone is a great way to connect with some of those people.

What do you think the biggest obstacle is moving forward with a project to product?

In context of iGEM? Or generally?

In context of iGEM, for now.

I think iGEM is an incredible period where you can go and test ideas and you can be exploratory, get a lot of feed back, act as students and figure out what works and doesn't work. As much as possible use this opportunity to really learn about the problem to really explore how what you're developing could be used as a solution. I think one of the things that, as an iGEM judge, I see a lot that is a bit of challenge is that a lot of times there are ideas that get represented on stage or on wikis where they haven't really understood the full life cycle that there going after. I'll go back to that again.

What I mean is sort of justify to me and the rest of the judges why your synthetic biology solution is not only a good idea but its something that would be adopted by the industry. As an example I've seen a lot of projects that have come up with a really cool pathway in bacteria to make something happen but there's no rational for why they would ever be able to break down the compound or produce that chemical at a concentration or quantity that would be appropriate for the industry they're looking at. At the core there's no understanding of how they would make this a viable alternative. In the context of your project, I would be really interested in how they deal with waste today, what are the economics of it, and maybe you're not at the scale you need to be, BUT is it feasible to imagine a synthetic biology solution that could not only do as well as what's going on right now, but that could vastly out perform it.

Why is synthetic biology the best solution to the problem you're looking to solve. That's a really key differentiator for projects that demonstrate value at the competition.