Patrick Moorhead: Tony, welcome to the Six Five Summit. Thank you so much for coming on.

Tony Uttley: Thank you for having me. It's good to be here.

Patrick Moorhead: Yeah. It's great to see you again. I mean, you've had a very exciting couple years. We've gotten to know each other and the team really well. I mean, whether it's Honeywell, whether it's you coming together with Cambridge, now as Quantinuum, the action never seems to stop.

Tony Uttley: I think, I think that's right and I think that's one of the most exciting things about the quantum computing space is and I know a lot of people describe it as this technology that's always 20 years away, but this is the decade. This is when it's happening and the advancement is, has been and continues to be terrific.

Patrick Moorhead: Yeah. It's great. I'm going to hit you with the first question I have for you is literally the first question I get from everybody, who's not inside of the quantum computing industry. That's how long before quantum computers are commercially useful and not necessarily better than anything else, but just commercially useful?

Tony Uttley: Yeah. I get that also all the time and what's, I don't know if it's funny is the right word, December of 2021, that'd be last December, that was a big moment that happened. That was when quantum computers became commercially useful. It happened. It already happened. Why? Why is that? Because we are in an era where people are talking about still being able to not just classically simulate what is going on with a quantum computer, but being able to do that on your laptop. Is that a true statement? Yes. That is a true statement.

How can quantum computers do something today that are useful? Because it turns out that they are quantum mechanical systems. When we have things and people will have heard these terms, but they're so special to quantum physics and quantum mechanics, things like super position, which is the ability for these wonderful qubits to be in both a zero state and a one state simultaneously. Things like entanglement, where you have something that you can know about these qubits, if you have imparted quantum information in them together, and then separated them. When that's happening in a quantum computer, it is really happening. When it's being simulated in a classical computer, those things are not happening.

What happened when you took a quantum computer and you actually created these superpositions and you actually entangled them? Well, we are now able to generate the most secure encryption keys that have ever been generated. Why? Because encryption keys need to be unpredictable, completely unpredictable. They need to be random.

The thing that quantum computers can do, if you know how to do it well, is to be able to use the quantum mechanics, to create these perfectly random output. Output that you know what it is, you can verify it, and it is something that's called non-deterministic. Non-deterministic, meaning there isn't a way there isn't another method to be able to figure out what that random number really is. That has already happened and now is available. It really became the first product that can use today quantum computer.

Patrick Moorhead: Yeah, so interesting, tony. You actually took something that some people might feel is a challenge with quantum computers and turned that into a positive. Just for the viewers, Tony, can you tell everybody what is the name of this service and how do they, how can they get it?

Tony Uttley: Yeah, we very appropriately called it Quantum Origin, and I love that. I continue to love it. Quantum Origin is both the service of providing these encryption keys, quantum computing enhanced encryption keys, as well as the protocol that can be used to be injected into a company's current method for creating these encryption keys, but being able to do so with a quantum enhanced way.

We do that today and there are already customers that have taken quantum origin and put it into production. Pure VPN is one of them, where their customers are now having access to their VPN service that has been protected with quantum computing, enhanced encryption keys.

Patrick Moorhead: They say never to ask a follow up question unless you know the answer. I think I know the answer to this next one, but I do think it's important for people to understand this in context, that, "Hey, we're happy that we have something that's commercially useful, but is the team satisfied, well satisfied where they are I know, but are you satisfied with the progress of quantum computing?"

Tony Uttley: Yeah, that's a, that's a great question. I guess as the president of any organization, you can never be satisfied.

Patrick Moorhead: Exactly.

Tony Uttley: But I am thrilled with the progress of quantum computing and it is, it's hard, I think for most people to live in the moment and then try to step back and think about some of these things historically. What has happened? What has happened just in the last few years and what has happened is that quantum computers exist. Yeah. This is a big deal, a profound moment in time where quantum computers exist and you can use them to do these quantum computations.

Then a lot of people's heads got wrapped around, "Yeah. But can you can simulate it classically?" No, no, no, that's a great, that's a great period of time. Again, something that will only exist in a sliver when we look at back on this in the future, is that you could do quantum computations on a quantum computer and then check the results with a classical computer to start to build up that confidence and trust that you get the correct answer. In the meantime, we find out that we can do something profound with the systems that exist today, like Quantum Origin.

Patrick Moorhead: Right.

Tony Uttley: We can use it to create these near perfect encryption keys. Is there a lot to do? Yeah, it's called the future. There's a huge amount to do. Every decade is going to be great, but are we making the progress that we said we were going to make? Yes. I think that's the other one that was really big for Quantinuum, is... I personally made a statement in March of 2020, saying we were going to release our first quantum computer in June.

We said what the quantum volume, which was this measure of its performance, what it was going to be and that every year for the next five years, we'd be able to increase that performance by an order of magnitude. We have done that. Absolutely, as we said we would, make the data available and showcase that these systems are incredible, especially if you know how to precisely control them.

Patrick Moorhead: Tony, I want to move to ecosystem here. Every new technology has its ecosystem of investors, startups, pundits, the press. Now we've got the social media requires some excitement to get an investment cycle, right? Sometimes some people might call excitement hype.

Tony Uttley: Yeah.

Patrick Moorhead: Some people I've heard say, "Hey, there's too much hype in quantum computing on that." What are your thoughts on that? Is there too much hype in quantum computing right now?

Tony Uttley: I think there's a lot of risk to too much hype in quantum computing, but it starts in a very interesting place. I had the absolutely enormous pleasure of being able to participate in the Hudson Forum that was put on by IBM. In fact, just in early May and something was said during one of the panel discussions that was so profound to me, which is, "The sense of wonder that is inspired by quantum computing, is so high and it's kind of knowledge that quantum computing is this incredible thing and can be the future is so widely known, yet nobody knows anything about it or how it works. But the sense of wonder is incredible and this future potential just exists," which is what a great place to be, what a grateful technology, where everybody's like, "Wow, this is going to be great."

Then there's this gigantic gap between people who would say that and know where we are today. There's such a important part of making sure that every step of the way is very factual, supported by data, has third parties, especially credible, academia, national labs that can take the opportunity to do these sanity checks and say, "Where are we really?"

Patrick Moorhead: Right.

Tony Uttley: Then it's incumbent upon everybody who's participating in the ecosystems. Companies like Quantuum, where we have to embrace the sense of wonder, but at the same time, say, "Here's where we are, everybody. Here's what the technology actually does, here is the progress that we're making and by the way, that's incredible too. It's an exponential progress, but we just have to remind ourselves that we have to support that with evidence."

Patrick Moorhead: I love the phraseology sense of wonder, and it... I was young when we started to go to space, but older enough, a few years later to see how it space really struck that tone. It's very similar to that today. I think that hype is an important thing, if nothing else, to paint the vision. In quantum, because we have so many academics involved, there's so much less hype than I've seen in other industries.

Tony Uttley: Yeah.

Patrick Moorhead: Let's say like full self-driving cars as an example. But I think it's important, but I love the idea of it being a sense of wonder, because that gets people interested in it.

Tony Uttley: Yeah, yeah.

Patrick Moorhead: Many of these applications are still years away, but we don't have companies just kind of sitting around and waiting for that. What are companies today doing in that field between now and when some of these applications come out?

Tony Uttley: Yeah, that's excellent. Maybe, okay. I'm going to give an assignment to the audience, which is just pick a company and Google it and say, "Is that company working on quantum?" Is that company working on quantum? You're going to find that there are a lot of really big companies around the world, organizations around the world that have dedicated resource to quantum computing. Why? Why would they do that? Especially when you're at a time where in the sense of quantum computation, you can simulate that classically and oftentimes just on your laptop. It has to do with what I said earlier about this period of time that we're living in, where that by itself is incredibly valuable.

Patrick Moorhead: Yeah.

Tony Uttley: That we can compute a problem and to call them toy problems is a disservice to the entire industry. We're taking problems and shrinking them down to solve on the size of quantum computers that we have today. The performance of these computers is increasing fast enough that you can keep on adding harder and harder problems and then you can check to make sure that it's getting the right answer.

All of that is happening right now in a advance of when we cross that threshold where you can no longer check the answer on a classical computer. Even the most powerful, super computer on the planet, you wouldn't be able to check that answer. Companies are spending the time, because the potential is so profound, that they want to be quantum knowledgeable. They want to have, if you could even call it, they want to have quantum native people so that they're thinking about these problems in a way that you can then translate to be solved on a quantum computer, so that they are ready. Because the organizations out there realize that even if you come up with something great, to be able to build that into your typical business process, that's three to five years to be able to do that.

Putting the resources in now to figure out how you'd make those process changes, where would come into play, what parts of your organization would have to change is what's happening. It's the right thing to do. It really is the right thing to do, to be prepared, to be able to maximize when this can take advantage for your company first.

Patrick Moorhead: Yeah, Tony, that makes perfect sense and it reminds me of how machine learning got popularized with ImageNet, where one of the first big tricks that ImageNet would do is to be able to determine if it's a dog or a person. Okay? Then as you got better hardware, better algorithms, it's a brown dog.. Brown dog with a collar sitting in a park. Brown dog, actually a golden retriever

sitting in a park in New York City because you could identify the buildings behind it. In a very similar way that I saw at least, image, intelligent image identification, this is the way it's happening today. Now here we are in machine learning where we're doing a lot more than just determining if it was a dog or a person.

Tony Uttley: Right.

Patrick Moorhead: I understand that you're launching a new quantum computational chemistry product. Tell us more about that. How did it come about? Why do customers need something like this?

Tony Uttley: Yeah, no, this is fun. Just last week, we would've announced to the world that we are releasing a product that's called Enquanto and the idea behind it came from the work that we were doing with our customers. This is... I love the story, because this is how products should work. All products.

We were doing projects with big pharmaceutical companies, material science companies, chemicals companies on these profound, big media use cases. To try to do that project, we developed software and then we found out that software was applicable across a lot of these different projects. We continued to build that software out and then we had our customers saying, "Hey, I saw you guys using some software. What is this supposed to do? Can we get access to it?" Yeah, sure we shared that and let people use it and then it was, "Wow, this could be, this could be a real thing."

We built out a version of it. We did beta testing with customers, again, across material science and pharma and chemicals. Then you ask the questions that you should always ask.

Patrick Moorhead: Right.

Tony Uttley: Do you find this useful and would you pay for it? It turned out that the answer to both of those two questions was yes. We said, "Okay, well, it's, it is right. It's the right time to be able to launch this quantum computational chemistry product." We then have to realize where we are in history, right? This allows computational chemists to think through the steps that they have to take to translate their problems into quantum problems. That's what's going to have to happen. That's how you make a quantum educated workforce and start to be a little bit more quantum native in how you think about these things.

Then you can apply your problems to real quantum computers, so that as these quantum computers continue to increase their performance level, you can start to do harder and harder problem sets. That's where this came about. Is it 1.0 of something that will have years of usefulness? Well, that's the intent, right? It's working with these customers then who side by side with us, tell us in all the nitty gritty detail, what things they hate, what things would you change?

Which again, that's the way you want to develop a product. You want to get that feedback in real time, iterate on it and make it so it is useful. Now, is it like a thousand people at each of these

companies kind of a thing right now? No. It's the handful of people who need to do the really challenging quantum computational chemistry type problems.

Now, will that grow over time? Yes. Again, in a way of thinking about a future both business model, but also applicability, it's outstanding, but right now, get it in the hands of the experts. Get it in the hands of people who are going to find the high utility in their own job and their own processes, and then give them that extension to be able to run those on real quantum computers.

Patrick Moorhead: It's exciting to see a lot of these formally known as high performance computing areas, get a big boost from quantum. When will people actually be able to use this? Is it available now, in a couple months?

Tony Uttley: It's available now.

Patrick Moorhead: That's wonderful. That's exciting. That's what you like to hear. Quantum and now. You heard it here first, right? Not only do we have the one of the first commercially useful applications out there with security keys, but now we have a computational chemistry product out there. Does it have a special name?

Tony Uttley: Yeah. It's Enquanto.

Patrick Moorhead: It's so cool.

Tony Uttley: As you hear things like InVivo and things that would be that, how do you take the next step of using quantum, as you think about your chemistry problems, your pharmaceutical, your, your material science? It's a homage to thinking about it in that way and realizing that these are tough problems. They're tough problems to think about, tough to get your head around.

Patrick Moorhead: Right.

Tony Uttley: Provide tools that simplify it a little bit, even for these brilliant people, that comes with a lot of value.

Patrick Moorhead: Yeah. One of the special things I think too, is this is such a vertical application, meaning... Listen, I love horizontal, but I love vertical because it's just so much more applicable and you're looking for less of who's going to use this. You're you're very centered on this. I mean, listen, not that your new NLP and AI stuff isn't sexy, but this has a use now for a very specific use case. I think right now at the state of quantum computing and the way that people look at it, I think these are the most important types of applications you can get out there to reinforce that this is real.

Tony Uttley: Yeah. Get the right tools in the hands of brilliant people.

Patrick Moorhead: Yeah.

Tony Uttley: Let them tell you what they can do with the tools.

Patrick Moorhead: I love that. I love that. Imagine that using an ecosystem in developers and customers to map out their future. I love it. Tony, always enjoy my time. I really appreciate you coming on here for the Six Five Summit. Can't wait, Paul and I can't wait to get out there to see you again. I think the first visit was maybe before COVID hit.

Tony Uttley: Oh, yeah.

Patrick Moorhead: I think we're going to have to meet up again in Colorado or wherever home is these days.

Tony Uttley: Now, Pat, thanks so much for having me. Always a pleasure.

Patrick Moorhead: Appreciate it. Thanks.