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Transcript: Spencer Rascoff and Chad Rigetti Interview

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Spencer: Hi, I'm super excited to welcome Chad Rigetti, Founder and CEO of Rigetti Computing with me today. My SPAC, Supernova II, is merging with Rigetti Computing and helping them go public through a SPAC merger. I'm excited to be a supporter and an investor and a shareholder in Rigetti. Chad, great to speak with you. Thanks for being here with me.

0:00:20 Chad Rigetti: Awesome, good to see you Spencer.

0:00:21 Spencer Rascoff: So let's start with the basics. Can you explain to me and other mere mortals who are not wizard scientists like you, what exactly is quantum computing and why should we all care?

0:00:23 Chad Rigetti: Yeah, I would love to. Traditional computers. They've been getting better and better for the past 70 years since the invention of the transistor, but all traditional computers are still fundamentally the same at the bit level, so they encode information in bits which can represent either a zero or a one and those bits are physically built with transistors. Now quantum computers are fundamentally different. They encode information and something called quantum bits that are based on the laws of quantum mechanics, and quantum bits can actually simultaneously represent both zero and one at the same time, and as a result of that, quantum computers are imbued with this almost magical capability to solve problems by evaluating solutions simultaneously rather than having to do so sequentially as with all traditional computers.

0:01:23 Spencer Rascoff: Okay, so I think I once read that this zero-to-one difference between classical and quantum is sort of like imagining the flip of a coin, how it's heads/tails, heads/tails as it's spinning in the air. That's sort of classical computing, always zeros and ones. Now imagine if you flip that coin infinitely quickly, so it's spinning head/tails, heads/tails so quickly that it's basically heads and tails at the same exact time. That's what you mean by quantum computing and qubits being one and zero at the same time. Does that analogy hold up to you?

0:01:59 Chad Rigetti: It holds up to an extent, and it is a useful mnemonic, or framework if you will, to think about it. Ultimately, what quantum computers do is really leverage the laws of quantum mechanics that allows things like quantum entanglement, superposition to take hold. This is a fundamental theory of nature that's been around since the first 10 years of the 1900s, and it describes how nature works at the lowest level. It governs small molecules, electrons, photons, the subatomic particles that make up the universe, and quantum mechanics overall just allows different things to physically happen. It's a different physical theory than what's called the classical Newtonian laws of physics that govern that coin that you're flipping. No matter how fast it's spinning, it's still governed by Newtonian laws of physics. And what quantum computers are able to do is tap into that deeper, more powerful theory of nature and to leverage those principles to encode and process information in exponentially more powerful ways.

0:03:03 Spencer Rascoff: So these computers that Rigetti and others are building are machines, they look like servers and regular computers that you might see in a data center, and they are connected to the cloud, so that customers can access these quantum computers through the cloud, through Amazon Web Services and others. Am I describing it correctly?

0:03:25 Chad Rigetti: That's exactly right. So Rigetti is what we call a full-stack company. We're vertically integrated from quantum computer chip design and fab and chip production through integration into what we call quantum processor units, through integration with cloud software and cloud computing infrastructure to deliver the power of quantum computing to end users and customers, and also to allow them to leverage quantum in tandem with existing classical computers like GPUs or FPGAs to solve these high-impact computing problems with better performance, you can do with quantum.

0:04:01 Spencer Rascoff: So who are some examples of customers that would use quantum computers and what problems would they aim to solve?

0:04:07 Chad Rigetti: We're starting to see uptake and interest in quantum computing from organizations around the world. Public sector. Private sector. What's happening right now is that substantially all organizations that use computing as part of their strategic advantage or core operations are starting to look to quantum computing. They recognize what's coming next and are starting to lean in to bring the technology into their organizations. Some examples: we've got a contract with DARPA, the Defense Advanced Research Projects Agency, where we're developing a next generation quantum processor for

applications to network optimization. We've got contracts with the Department of Energy and Lawrence Livermore National Lab where scientists are using Rigetti quantum computers to simulate the reactions to take hold in a nuclear fusion reaction. This isn't weapons, this is about unlocking limitless clean energy from the same nuclear reactions that power the sun. It's one of the most important and transformative but emerging technologies in the world and its finding application in a lot of different domains. Now on the private sector side, we've got a partnership with Standard Chartered where we're looking at applying quantum computing into financial markets, as well as with Astex Pharmaceutical, where we're developing quantum computer simulation capabilities for drug target development.

0:05:29 Spencer Rascoff: So if you're a company that has an impossibly difficult problem to solve, like UPS trying to figure out how to route every package around the world or a pharma company trying to model how a drug would interact with human biology. Currently, those problems are being solved on regular classical computers, and that might take days, weeks, months to run, but on a quantum computer, they can be solved in days, minutes, hours? Give us a sense of the step change of improvement that quantum can deliver as compared with classical.

0:06:08 Chad Rigetti: In the future, quantum is going to be able to solve problems that are what we call classically intractable, so problems that you just can't solve with any current or future classical machine, no matter how big you build that system. Today quantum computing has now been through 20 years of research, starting in academia and then pushing out into industry. Rigetti is eight years old and we've been pioneering this technology for the better part of a decade. Today, quantum computers are close to achieving a threshold that we call quantum advantage. And quantum advantage is where you're able to solve a problem with improved accuracy, speed or cost with quantum computing in the loop, if you will, relative to no quantum competing in your solution. That's going to be a big inflection point in the industry going forward. There's a next inflection point after that, Spencer, that we think of as broad quantum advantage. This is where you go from, maybe not a factor of two or five cheaper than a purely classical solution for solving that problem, but it's actually able to solve a problem that today isn't addressed with computation at all, because it's just beyond the reach of classical computing. This is what we call broad QA, the broad quantum advantage. In that case, you're going to start to bring new kinds of work flows into a compute-based solution for the first time. I think ultimately quantum computers are going to disrupt not just existing computing solutions, but ultimately things like wet chemistry. Instead of doing, you know, synthesizing a molecule through a wet chemistry approach at the bench in a lab, you're going to be able to do simulation-driven design of new molecules, new medicines, new materials. Quantum computing is going to be able to fundamentally accelerate the rate of technology advance around the world.

0:07:47 Spencer Rascoff: So let's take a step back and go through your career coming out of college — what does one even study in college to start as a quantum computer scientist? And then walk us through IBM and then the start of Rigetti.

0:08:04 Chad Rigetti: You bet. So I remember very well, I was a junior in college, I was a physics major, and I was taking a class in computer science. I wasn't the best computer scientist, and I was also taking a class in quantum mechanics — a first class in quantum mechanics as an undergrad physics major. I was struggling because two things were weighing on my mind at the same time, and I couldn't grasp them. One was, "What is this theory of quantum mechanics?" It doesn't make sense, there's all these strange phenomena like entanglement and superposition, and it doesn't map to you the natural macroscopic world that we live in day. So it was beguiling. And then at the same time, I was taking a computer science class and asking the question of, how does a computer actually work. I'm not talking about how do you turn it on and how do you program it, but how does it actually encode and store information at the metal, as people say. And I was wrestling with those two ideas and questions, and I just thought, "Hey." Then I read about this field called quantum computing, and I thought, "Maybe I can answer one question instead of two, and just say, how does a quantum computer work?" And then I'll be able to understand both quantum mechanics and quantum computing as well as how traditional computers work, and I got very interested in the field.

0:09:27 Chad Rigetti: I went and did a PhD in this area at Yale University. I looked for a research group that was working on what I thought at the time would be a potentially scalable technology for quantum computing, and that led me to a superconducting qubit research group at Yale led by Professor Michel Devoret, who's one of the luminaries in the field, has trained many of the leading scientists and engineers in quantum computing. He's made incredible contributions to quantum computing overall. I also did postdoc at Yale, and then I joined IBM research in 2010. I spent about three years at IBM, and it was a very exciting time. Quantum computing was starting to move out of the lab and academia and move into industrial research for the first time, and ultimately by around 2013, I could see trends happening in core quantum computing research. There were multiple different problems to be solved at that time. You needed better qubits, you needed longer coherence times, you needed better quantum algorithms and you also needed better what are called error correcting codes, ways of driving effective error rates to zero at scale. And ultimately, there is incredible progress being made around all these fronts, simultaneously, and I saw those trends, and I made the decision to start Rigetti Computing because I saw an opportunity to build a vertically integrated player — a vertically integrated company that would solve the engineering challenges needed to bring quantum computing truly to the mainstream market. Now, eight years later, the incredible engineering team and incredible researchers at Rigetti have developed some just pioneering technology, and they've solved the scalability challenge in quantum computing with a multi-chip technology solution that we believe will allow us to really leap to the leadership role in the overall global quantum computing race.

0:11:14 Spencer Rascoff: So you've raised venture capital throughout the eight-year journey, you've staffed up, couple hundred employees now, primarily in the Bay Area, but also distributed now, and you've decided to go public through a SPAC merger with my company Supernova. Tell us about that transaction. Why decide to go public? What do you think it means for Rigetti and for the technology?

0:11:39 Chad Rigetti: This technology has been in development, as I said, for a couple decades now, and it's reached an inflection point. At Rigetti, we've solved the scalability challenge with a multi-chip processor architecture, and now it's been more than four years we've been consistently operating our quantum computers over the cloud. We built up a foundation in the business of long-term customer contracts, growing the revenue, and now is the time to... We're going to fully capitalize the business, we're going to fully capitalize the balance sheet through this transaction. We're going to be able to invest these proceeds into accelerating our product development. So over the past eight years we've raised $200 million in capital and invested that in building an incredible organization. And we've really been going serially, kind of one generation after another in the chip development. We're going to be able to accelerate that by paralyzing it going forward, and then we're going to be able to bring this technology to the broader market through our cloud distribution partnerships. In this deal, I'm incredibly excited about the partnerships we've got as well. As we step into the public markets, the opportunity in quantum computing is truly enormous. McKinsey and BCG have both looked at this and they say it's somewhere between several hundred billion to a trillion dollars long-term. It's mind boggling. The size of the opportunity -.

0:13:19 Spencer Rascoff: Sorry to interrupt. That's what they're estimating that within 10 or so years, companies will pay to quantum computer companies to use their services. Is that correct?

0:13:30 Chad Rigetti: They've got their methodologies. All I take away from that, is it's a really big number. It's really a big market. And so what we're doing now, Spencer, we're investing in the business, we're investing in the team, and we're taking it public through this transaction and ultimately we're stepping... when we go out and look for new partners or for new customers, there's IBM, there's Microsoft, there's Amazon that are out there, all these are big participants in the space. And we're just thrilled about the platform of being a public company and building the leading global player here.

0:14:05 Spencer Rascoff: It's an exciting time for Rigetti, an exciting time for the technology and for the world. Once this technology becomes more commercially available over the next couple of years, it has the potential to have a massive, massive impact on so many industries. It's going to be amazing. It's fun for me to play a tiny, tiny part in this, in the growth of the company, and I'm really excited for Rigetti. Thanks a lot, Chad, for the discussion and thank you for illuminating me and others that are watching this. Good luck.

0:14:38: Thanks, Spencer.

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Additional Information and Where to Find It

Supernova Partners Acquisition Company II ("Supernova") has filed a registration statement on Form S-4 with the Securities Exchange Commission (the "SEC"), which includes a proxy statement/prospectus, that will be both the proxy statement to be distributed to holders of Supernova's common shares in connection with its solicitation of proxies for the vote by Supernova's shareholders with respect to the proposed business combination and other matters as may be described in the registration statement, as well as the prospectus relating to the offer and sale of the securities to be issued in the business combination. After the registration statement is declared effective, Supernova will mail a definitive proxy statement/prospectus and other relevant documents to its shareholders. This communication does not contain all the information that should be considered concerning the proposed business combination and is not intended to form the basis of any investment decision or any other decision in respect of the business combination. Supernova's shareholders and other interested persons are advised to read, when available, the preliminary proxy statement/prospectus included in the registration statement and the amendments thereto and the definitive proxy statement/prospectus and other documents filed in connection with the proposed business combination, as these materials will contain important information about Rigetti Holdings, Inc. ("Rigetti"), Supernova and the business combination. When available, the definitive proxy statement/prospectus and other relevant materials for the proposed business combination will be mailed to shareholders of Supernova as of a record date to be established for voting on the proposed business combination. Shareholders will also be able to obtain copies of the preliminary proxy statement, the definitive proxy statement and other documents filed with the SEC, without charge, once available, at the SEC's website at www.sec.gov, or by directing a request to Supernova's secretary at 4301 50th Street NW, Suite 300 PMB 1044, Washington, D.C. 20016, (202) 918-7050.

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