

Startup Companies: Success Due to a “Culture of Self-Delusion”

Interview with Eugene Fitzgerald, Co-Founder, Chairman Emeritus, AmberWave Systems, Corp.

Innovation has become a buzzword for national governments around the world as they seek mechanisms to climb the economic ladder. The United States is no exception. Recently, we have seen the National Innovation Initiative, the American Competitiveness Initiative, the Protect America's Competitive Edge (PACE) acts, the “Rising above the Gathering Storm” report, and at least a dozen other named efforts. Yet, while policy experts analyze and politicians legislate, they can hope only to influence—not control—the root of all innovation, which is individual action. How do individuals innovate? How does it actually work—in the United States or elsewhere? How does one take a standard degree or standard career track and turn that path into a new product that launches a new company, with oneself at the helm? How can one do this without going broke or unintentionally demolishing one's career? To provide insight to these questions, and to highlight the myriad ways in which entrepreneurs become who they are, we present this interview with Eugene Fitzgerald, co-founder of AmberWave Systems, as the first in a series of profiles of individuals who have successfully developed new products or new industries around materials innovations.

—Merrilea Mayo, interviewer

Can you say a few things about your startup company, AmberWave Systems? What is its product and what will it be used for?

AmberWave's product is strained silicon technology, and the company evolved over time into an IP holding company. “IP” stands for “intellectual property.” AmberWave holds patents on our invention and licenses the materials and the chip process to different factories around the world, collecting royalties.

The strength of our technology is that strain induces GPa-level stresses within the silicon, which in turn enhances carrier mobility of electrons and, less so, holes. The key was to be able to make the strained silicon without inducing defects such as dislocations, which in turn required getting not only the right substrate to induce lattice-mismatch strain in the first place, but also controlling nucleation and crystallization on that substrate. We were able to use silicon germanium underneath the strained silicon.

When we started commercializing our product, we had difficulty explaining to venture capitalists and other nontechnical folks—once they understood all the electronic activity was still in the silicon—that we use a layered system of silicon, then relaxed silicon germanium, then silicon.



Eugene Fitzgerald

In fact, I would like to hear your five-minute elevator speech. How did you pitch this innovation as something that can make an obscene amount of money?

I said that with this technology you can produce the next generation of silicon technology, with faster clock speeds, without investing in an entirely new factory that would otherwise be required if you had to go to a whole new material. You can jump ahead to the next part of Moore's law faster and cheaper than your competition.

What constitutes an “enormous amount of money” in the venture capital world? What kind of returns do you have to expect before the VC community gets interested?

Venture capitalists first want to see a large enough market that already exists. They look at market risk, technology risk, and management risk. The average venture fund is just trying to beat comparable safer investments by whatever number they can, so their objective is if they can capture 1000% of return to their limited partners, they will go for it.

In a VC portfolio there is a distribution curve of expected returns, from safer investments with lower expected returns, to riskier investments with higher expected returns. A project that will not yield returns for more than two years and still has science risk left would need a higher rate of return to qualify for venture capital. The expected rate of return for AmberWave is probably a factor of 10.

How much venture capital has AmberWave raised, and as a non-employee founder, how much of the company do you still own? The latter is a trick question from your venture

capital firm; maybe they are checking your answer against the company book.

I think the VC firm is saying that considering the amount of money the VC spent, I am actually in a decent position—probably better than most would be after spending \$60 million.

If I spent \$60 million I would be out on the street without a house.

AmberWave has raised \$60 million across its several rounds of venture financing. Here is what most founders should expect: Unless they have incredible luck in a variety of ways, they are not going to own 50% of the company, or 40%—not even close. I think a lot of scientists, when they start off, are thinking that way, but a lot of resources have to be applied to get that idea out there, and they have to share it. First of all, in your own company, tens to hundreds of people work with you to achieve this goal, and then they have to be indirectly getting the effort of thousands of people in the marketplace. So the venture game is one in which the idea has to be big enough for the venture capitalists but also for the founder, where the percentages need to be applied to a large number of people who each want to get significant gain.

Since you wear two hats, do you ever feel like a split personality? Which skills and abilities are useful in both the academic world and in the venture capital world?

From the outside, I probably do look like I have a split personality. But inside, because of who I am, there is no discontinuity at all. I want to work with students who want to do great research that they also believe will have an impact somewhere. An example of a great scientific problem is cell differentiation. How does a cell differentiate itself? Where is that information stored? How does it know? We know that when we figure out the answers, the impact is going to be huge in a variety of areas. The Massachusetts Institute of Technology's licensing office supports that dual mission; MIT feels that moving technology into the marketplace is one of the ways we can show value for our research.

I think that we have this misconception in our society that the skill set for science and business are extremely different. Going to agencies and companies to pitch research ideas is great preparation for doing the same to start a company; in fact, they are not that different because there is always a customer.

What step-by-step advice would you give students who think they have a great moneymaking idea but are not sure of what to do next?

There will be a network of people on campus who have experience in the different stages of starting a company. Meet with a professor who has been involved in this process, who will then introduce you to other people, who will introduce you to yet other people. . . .once you get into the network, there is a lot of expertise you can tap. Some universities are now starting to consciously set up these structures.

What was the biggest mistake—oops, I mean “learning experience”—you have had in your life as an entrepreneur?

There are so many of them! I am trying to pick the most severe. I would probably say understanding the average human being outside of the engineering science community. Those of us in the sciences assume that everyone is very similar to ourselves, which actually allows us to be very efficient within our community. But that is a huge mistake outside of our community. Understanding people outside of the scientific community gives us

a very different view of how the world works. And the consequence is that we will never be able to go back to the comfortable worldview we once had.

Pretend you are an anthropologist. What would you note as a bizarre ritual or cultural practice specific to the entrepreneurial community?

Ah! I have the answer! What you see very consistently is that it takes more time and money than anyone anticipates—and this happens at each stage. If that reality were put forth, no one would move ahead, not the entrepreneur nor the investor.

So a culture of self-delusion is required for success.

In fact, I would argue that the reason the United States, in particular, is in the lead in this sort of activity is two factors: the propensity for complete over-optimism, combined with greed. The two forces together create this sort of weird ritual in which everyone always gets over-optimistic; but that process, when it occurs over and over again over a span of years, is what it takes to move a technology to the

marketplace. If you were going to be completely analytical and unemotional, you could find thousands of reasons—completely justifiable—of why you should never put forth the effort. And that is what is unusual about our society.

Do you have any parting comments, words of advice, or large checks you would like to give out before we close this interview?

There is no better activity to enhance both your research and your intellectual curiosity than to think about how your research will impact the outside world, and the more you delve into that, the more synergy you will find between those two sides.

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