Dwarkesh Podcast #69 - Patrick Collison (Stripe CEO) - Craft, Beauty, & The Future of Payments

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Dwarkesh Patel
Today I have the pleasure of speaking with Patrick Collison, CEO of Stripe. Patrick, first question. You have an excellent compilation of advice on your blog for people 10 to 20. You say there, that once you turn 35, you'll write some for people in their 20s. What advice do you have for us now, the people in our 20s? When is it coming?

Patrick Collison
I haven't really thought about that. The one piece of advice I've been wondering about recently is this: I said that people in their teens should go to San Francisco. I wonder if people in their 20s shouldn't go to San Francisco. That advice was a generalization. There's a significant set of people who should go to San Francisco. But there is a set of career paths that people ought to pursue and would derive most fulfillment from pursuing, that are also really valuable for the world, that require accumulating a lot of expertise and studying a domain in tremendous depth.

I think San Francisco valorizes – this is also San Francisco's great virtue. San Francisco valorizes striking out on your own, iconoclastically dismissing the received wisdom. It praises the founding archetypes and lore of Steve Jobs and Bill Gates and all the rest. I'm way less successful than those people, but to some extent, Stripe, in as much as it fits a pattern, is an instance of that pattern. That's great, I'm happy that this phenomenon exists in the world. But the world needs lots of other things. And I don't think San Francisco, using San Francisco as a kind of a metonym for a cultural orientation, encourages the pursuit of really deep technical knowledge.

We're recording this in South San Francisco, which is most noteworthy in the corporate world for being the headquarters of Genentech. Genentech was co-founded by Bob Swanson and Herb Boyer. They produced cheap insulin for the first time with recombinant DNA. Like Herb Boyer couldn't have done that at age 23. Herb Boyer first had to accumulate all of the knowledge and the skills required to be able to invent that over the course of a multi-decade career. I don't know what age he was when he finally went and invented it, but he was not in his 20s. I feel like San Francisco doesn't culturally encourage one to become Herb Boyer.

Or yesterday, at the time of recording this podcast, Patrick Hsu, one of the co-founders of Arc, which maybe we'll speak about later in the show. This is a biomedical research organization we started a few years ago. He announced this new phenomenon of bridge editing, which is a new recombinase where you can insert DNA into a genome. It's pretty early, but it might turn out to be quite consequential. In order to do something like that, you have to study for a long time and acquire a lot of technical skills.

I don't quite know how to synthesize it yet, but as I think about advice for people in their 20s, I'm not going to normatively pretend to know or presume in which direction one should go in

life. Obviously, there are successful examples of basically every strategy. I'm really glad that you're doing what you're doing at what age?

Dwarkesh Patel
23.

Patrick Collison
23. So that's...

Dwarkesh Patel
A podcast, I've got a podcast.

Patrick Collison
I think information dissemination is a really valuable thing in the world. The guy, who, last time I heard, was in the lead for Nat's Scroll Prize, learned about it, listening to your podcast. Increasing the catalytic surface area of certain kinds of information is a valuable thing in the world, so I'm very glad you're doing the podcast.

Anyway, I don't presume to know what people should do with their lives. But in as much as I was trying to give advice, especially if they're reading my advice and not someone else's, maybe they're thinking about career paths that look directionally like mine, I think my advice might be: "Maybe you should do something like what I did or I'm trying to do. But there are other paths as well. A lot of really important inventions in the world and a lot of the things that I'm most happy are happening, require a very different trajectory from mine. There are counterfactual versions of my life, where I pursued that path and who knows how well it would have worked."

Last point is that San Francisco is very status oriented. Everything is status oriented, so the previous statement is kind of tautological. I feel like in San Francisco the entrepreneurs are held in excessively high regard. Look, I like entrepreneurs as a group in the world. All the companies built in Stripe I think are great. But there's a strange emphasis placed on entrepreneurship in San Francisco, that should not be people's only fixation.

Dwarkesh Patel
What I like about this and what I admire about you is that you have this sense of contrarianism – the way you often challenge what people are expecting to hear from you in a given moment. You just really want to tell them the opposite. When EA was a little more popular, you were talking about the important problems, and when it was down in its depths, you were like: "Hey guys, pay attention." But on this particular piece of advice...

Patrick Collison
Michael Nielsen says that every field in science has way too many adherents or way too few. The market is almost never in the right equilibrium and I think something like that might be the case for EA. I think reflexive contrarianism for the sake of it is also tired. If you're just contrarian to the prevailing mood, then you're following the prevailing mood but with a sign bit inversion. I don't endorse that either.

The herd is a really powerful phenomenon. One of the learnings of my adult life has been something, that everyone knows and says or frequently hears, that you should be very wary of following the prevailing tides and moods and whims and everything. But it's freaking hard to do in practice.

Dwarkesh Patel
So what practically does that look like to hone your craft in any of these disciplines that take a long time? You've spoken and tweeted about some of the problems with modern universities. Is that still the de facto path if you want to be the great biologist at Arc or something?

Patrick Collison
In many domains, I don't know. For example I have no facility with or experience with doing things in hardware, which is not a small domain. If you wanted to become a super skilled practitioner there, what's the best career path? I don't know. Maybe it's to drop out and join SpaceX or something. I'm not necessarily endorsing pursuing the most establishment and credential oriented path. People should try to find the gradient of maximal learning in whatever it is they care most about. The question then is what that is.

For biology, not that I'm a biologist, but it is very clear that in order to do really good work, there are a lot of "bench" skills one has to acquire and there is a lot of actual specific knowledge. Any kind of life wasn't designed with neat fundamental principles the way that maybe physics was. A lot of it is obviously evolved and contingent and messy and complicated and all the rest. So there is a lot of specific factual stuff to learn.

For those two reasons, there are very few successful pure autodidacts in biology. In virtually every case that I'm aware of, at some point, you have to get direct experience in and with a top lab, where you're seeing how people actually do it in practice. This also ties back to what we were discussing previously: your question about the founders and what they learn from each other and so on.

There's an interesting book, Apprentice to Genius, that follows three generations of scientists. So someone who mentored somebody else, who in turn mentored another scientist. And they're all extremely successful. The book is this description of what they all did, but also this reflection on: "What is it that was transferred?".

For example, one of the most important and subtle questions in science is problem selection. How do you choose what to work on? No one tells you what to do. And you do have to answer this question multiple times. With a company, in some sense, you have to decide it once, and then it's an iterative process from there. Whereas in science, you're frequently pursuing completely new problems. You need to choose something that's sufficiently important and hard, so that it would be important if you succeeded, but it also mustn't be so complex that progress becomes unachievable. This is what mentees learn from their mentors according to the book.

Another thing the book talks about is learning about high standards and what they actually are. When I talk to people in other domains, I hear very frequently, that when they worked with X person or Y organization or in Z environment, they learned what great actually is. And that just permanently changed their sense for what their own standard for their work ought to be. So one version of what people in their 20s should do is get some ideas for domains you're interested in, but then figure out where can you learn the highest standards, where are the highest standards embodied, and where can you go and experience that first hand.

Dwarkesh Patel
Before we get back to Stripe and Arc Institute, I want to touch on the Parker study for a second. There's a view that says: "If we improve the NIH 10% or whatever percent, are we really making a dent in the fact that ideas are getting harder to find over time? And how much of a difference do institutions make anyways? Is it just about a number of researchers and how many people in society you can put into research? It's not like Singapore can get a much more effective scientific institution that lets it compete with America in science by following this approach.

What's wrong with that intuition?

Patrick Collison
Noah Smith and others have talked about, I can't remember the term he used, something like “moneyism”. He had a funny phrase. It pertains to the presumption that there is some constant elasticity between investment in some particular outcome, like building a semiconductor factory in Arizona or a new bridge, and the outcome of the factory or the bridge. First of all, the conversion rate between those inputs and the output is not a cosmological constant. Maybe any of these things could be done for half or a tenth of the cost. Secondly, there are even deeper questions as to, is it possible at all? What else would have to change for it to be possible? What are the other constraints? By talking about these things in funding and dollar terms, you're making the implicit assumption that the only relevant constraint is the financial one, where in practice, maybe it's permits or labor shortages or other things. In the context of the NIH and science and R&D, I'm really

skeptical of this approach being brought to bear, where we can just talk about the amount that we're spending on R&D and think that that's implicitly a useful measure of the output.

To a fairly close approximation, there were around 1% as many practicing professional scientists in the US pre-World War II as there were post-World War II or say even 1950.

The other epiphenomena in papers or patents and so forth tend to follow pretty similar ratios. We got a lot of pretty good stuff in the first half of the century. Despite increasing the amount that we spend between two and maybe slightly more than two orders of magnitude it's not clear to me that there is a direct linear relationship between spending and output. When analyzing the NIH or how we should pursue any of this stuff, I try to get more concrete and tactile and think, what would success here look like? What is happening today at the microscale? What are the actual problems? What could success look like at the microscale? What might it look like to scale that up?

One example of that, we ran a survey of the Fast Grants grant recipients after Fast Grants asking about their normal work, and not about anything to do with Fast Grants itself. We asked them if they had flexible funding, that is to say if they could direct their current research dollars however they wanted how much their associated research program would change. And we gave them three options: not much, a little, and a lot. Four out of five (79%) said that their research agenda would change a lot if this constraint was removed.

Asking: "Should the NIH funding level be X or 1.1X or 1.2X or whatever?" seems to me like a bad way to analyze this question as compared to: "How bound and constrained should an NIH grantee be in choosing their research agenda?" Maybe their judgment is way better than that of the committees, not saying it is, but who knows? Maybe there's a 5X improvement to be generated just by making that one switch? I'm very skeptical of these financially-oriented frameworks.

Dwarkesh Patel
Maybe financial is not the right word for it, but just trying to map inputs to outputs is the framing, which you're using to compare the pre-World War II inputs to what's happening now. If it was particular to the scientific institutions, you'd expect, for example, that things that are disconnected from the NIH-specific structures would show different trends. You've talked a lot about the fact that it's getting harder to find impactful papers. Sector through sector, it's not like NIH is running Moore's Law progress, right? But even there you see that you need exponentially more researchers to keep up the same level of progress. It does seem important to have these "level effects", that are one-time, in the case of something like COVID happens, where we say: "Yeah, we need that level-effect" right now."

But if we're framing it in terms of hundreds of years from now, I wonder if these events are going to be a thing that increases growth rates, which is a sort of framing that is also applied when talking about progress.

Does that make sense in that context, when all sectors are seeing slowdowns, which seem consistent with how the economy and science progresses over time?

Patrick Collison
"I don't know" is the short answer. It's really puzzling. The constancy of US GDP growth is one of the weirdest things. I don't know if I've got an explanation for it. An obvious thing to do would be to shrug and say: "OK, well, it's overdetermined, and that's just how countries work." But you can look at other countries, where it's manifestly not the case. What is it that's weird and special about the US?

The thing that I wonder about in a lot of these cases is: you could get many of the observed system phenomenon characteristics, if we weren't actually adding productive capacity. That's a simple way to explain a lot of it, in that if you're just adding exponentially more unproductive capacity, then on a stylized level, a lot of this stuff would just fall out of it. Now, I'm not saying that we're necessarily doing that, but it could be that maybe we're making them... There's lots of ways where that could be quite effectively going on, even if it's not the case that the marginal people or things or organizations themselves are bad. It's just how the components interact. But the fact that you could get these exponentially diminishing returns through the addition of ever more nonproductive capacity makes me not persuaded that the low-hanging case is necessarily true, and gives some weight to the prospect that it's fundamentally structural, cultural, or organizational.

Just to give a micro example there, and it's a very basic and an obvious one, it's interesting to compare the SpaceX R&D budget and the NASA R&D budget and to actually look at those two time series together. Maybe we're just returning to the financial point again, but it seems pretty clear that the trajectory of NASA's efficacy has not fully followed the trajectory of its inputs.

Dwarkesh Patel
Yeah, although the point about: "the marginal inputs we put into science have not been as effectively used as what was before". The 1X then was a 1X of much higher quality, than 100X now. It's not clear what you do to fix that. If it's just a case, that there's a limited amount of John von Neumanns in your society, that are part of the pre-World War II 1X, it's not like we can just put 100X more John von Neumann-type physicists into science.

Patrick Collison
If the binding constraint is the number of John von Neumann's, then yes, that's bad news, I guess. There's not a lot we can do on the margin. But I'm not sure that it is. I keep going back

to the cultural and sociological point. Gerty and Carl Cori, they ran a lab at the University of Washington, St. Louis. And six of their students, if I recall correctly, went on to win Nobel prizes. They had a well-known lab, they got good students, but they weren't the most prestigious lab in the world. It's not like they got to cherry-pick every year the single most promising person, so something was going on there. There's a book about it, which tries to get into this a little bit. I don't know if I can figure out quite what it was. There was also some good fortune, where they got into molecular biology at a good time, but I think there were these "hopeful data points". Again, they were extremely brilliant people, but the thing that distinguished them and their students was not that they were these seven "sigma-Martians", it was rather that they found organizational structures and cultural practices that really worked. Those are, at least in principle, more replicable.

Now, you might still say: "OK, fine, in theory. But how do you actually do that?" That's the big open question.

Dwarkesh Patel
OK, that's a great point to talk about, Arc institute. I think you just answered this question but still: It's not exactly like biology research is, it's something that society has neglected. So what's the theory of change here? Is it just a story similar to Stripe? In that, if you get the right people, there's tens of billions of dollars of biology funding. Getting the right people, the right culture and right education is what it takes, right?

Patrick Collison
Even though there are lots of scientists and lots of universities, there's a lot of homogeneity today in how science, and in particular, how biomedical science is pursued, where basic research is done in an academic context before there's any commercialization prospect in sight. I don't know that this model is necessarily a bad one. Certainly, we're not claiming that it's a bad one.

Construct of universities, labs, PI — a principal investigator running the lab, who applies for grants primarily to the NIH, maybe supplemented by other sources, grants reviewed by committees with "study sections", as they call them, with pretty rigid scoring criteria and so on — that is the structure and it seems suboptimal to me.

Homogeneity is bad in basically any ecosystem, especially ecosystems where you're producing or seeking tail outcomes. And we thought that, for a variety of reasons, from first principles, other models should be possible. We had specific ideas as to how one particular model might be a good idea and complementary to the status quo.

In very short terms, what's different about Arc is: one, scientists are funded themselves to pursue whatever they want. So it's curiosity-driven research, whereas NIH grants are given for projects. Second, we build a lot of in-house infrastructure, so that scientists can draw

upon other platforms and capabilities that they don't have to build and maintain themselves. Whereas, in the standard university academic context, scientists would virtually always have to do that in-house. Because of the natural scale constraints on any given lab, that effectively circumscribes the ambition of a possible research program. And thirdly, we try to provide career paths for people to remain in science if they don't want to become principal investigators, whereas the university structure commingles the training purpose of academia with the execution — the people who are doing the work there are typically the grad students and the postdocs, who are themselves, at least nominally, on the career path of eventually becoming principal investigators. There are lots of people who, for all sorts of different very valid reasons, love science and the pursuit of research, but don't want to be a manager running a lab, choosing their own research programs, and dealing with all of the overhead and typically grant applications that are concomitant with that.

With Arc, we have a real emphasis on hiring scientists to finish their postdocs, finish grad school, who know that that's what they want to do in their lives. And again, it isn't really a career path for them today. One of the things that's really exciting about the discovery, that we mentioned, that came out yesterday, this new bridge editing technology, is: that work was led by one of senior scientists, who had finished his postdoc. It's not clear to me that he wanted to become a PI, but he loved science, and he's an amazing researcher, so he's able to go and have that career at Arc.

In addition, the prospect of mobile elements being usable in this way for genomic insertion, whatever, — that's a pretty speculative, out there thing. Had he applied to the NIH to go and pursue that? He didn't, so I don't know what the outcome would have been.

But Jennifer Doudna's work was, if I recall correctly, funded by DARPA, because her CRISPR NIH applications were rejected. Katalin Kariko's NIH applications for mRNA vaccine work were famously rejected. It at least seems very plausible that it wouldn't have worked out. All these things are random, and I can't make any definitive claims about what would have counterfactually happened. But it seems plausible to me that this thing announced yesterday wouldn't have happened or would have been less likely to happen in a different environment.

Dwarkesh Patel
When we think forward 10 or 20 years, this specific line of research, where you understand the effects of the genetic architecture on different traits, and you can edit, invert, insert the DNA arbitrarily. You've solved cell anemia — you've done the obvious things. What does that lead to? What are you excited about?

Patrick Collison
The thing that is really interesting about it is using it as a new kind of telescope: when people hear about CRISPR, there's an obvious and legitimate excitement around using this to cure things directly in the body, as a kind of therapeutic. You can also use CRISPR to try to figure out what's going on in cells and in cell cultures in a structured way. So the body is interesting in that it has this switchboard, akin to DJ's with those fancy mixing sets, of 20,000 genes. And with CRISPR, you can systematically go and perturb each gene one by one, mashing all the keys in sequence, and try to figure out what the effects of perturbing this versus that are. If you do that in a cell culture, where you can subject the cells to some stressor or treatment, you can see differentially how different perturbations affect different cell outcomes. Or you can use it for synthetic data generation more broadly, where you could perform all these perturbations, then sequence and see what's happening in the cells and so forth. And single cell sequencing has come a long way. Anyway, the point is, there's a lot you can do with gene editing for discovery and for data generation in the broadest sense.

That's really compelling, because a lot of diseases are "complex" in the field's jargon. Yes, they're complex in the colloquial sense, but they're specifically complex in that they're not infectious. They're not just some pathogen getting into you. And they're not monogenic, like Huntington's, where it's one specific mutation. Instead, they are some combination of environmental factors, but maybe some genetic factors as well — they are somewhere in between. These include most autoimmune diseases, most cancers, to some extent cardiovascular disease and neurodegenerative disease — the big ones we haven't yet solved.

Coming back to functional genomics technologies, what's interesting is trying to figure out how it is that the genetic component of those diseases works. And even if that's only a small contributor, it can potentially shine light on what the general pathway is. So the question would be, and this is speculative, none of this has actually happened: "By figuring out the genetic interactions between genes and, say, Alzheimer's, can you figure out how Alzheimer's arises, which we don't understand today?" Then once you understand how Alzheimer's arises, maybe you can use conventional technologies to figure out how to inhibit or modulate those pathways. That's what we're really excited about from a functional genomics standpoint. There's an AI angle as well that we could talk about if you want.

Dwarkesh Patel
How do you think about the dual use possibilities of biotech? I am sympathetic with the idea that if you think of prior technology, like Google search or even the computer itself, you could forecast in advance, like: "Oh, this has all this dual use stuff." But for some reason, history has been kind to us. The meta-lesson here is: "Keep doing science."

With biotech, we don't have to go into specifics here, but are there specific things you can think of with this specific technology? You can imagine some nefarious things. How do you think about that? Why not focus, let's say, on ameliorating the risks first or something like that?

Patrick Collison
I don't think that the binding constraint on harmful use of biotechnology or bioweapons today is pure biological capabilities. If some set of incredibly capable, intelligent people wanted to cause tremendous harm, presumably with pathogens or with something biological, they wouldn't necessarily need to invent anything new. They would just need to apply currently known techniques in a malevolently directed fashion.

There are some concerns and risks with respect to things that don't invent new technologies, but do make them more accessible. The question is, what would the effect on the world be if there was a sufficiently sophisticated LLM that could help anybody synthesize and disperse smallpox? I don't know laws of physics that prohibit such an LLM existing — I presume they don't. Would the world be fine if such an LLM was widely distributed? Maybe, but maybe not. So there is that threat factor, but my point is: I don't think knowledge at the frontier of biology is the relevant margin here.

If we take this seriously, we don't need crazy AI risks to motivate this. The world is perfectly capable of originating really severe pandemics and pathogens itself, plus all the other diseases that are not pathogenic. So we got other problems. Whether we care about the possible dual use harms you just mentioned, or we just care about things that already exist, to ameliorate both of those, we do need enhancement of our capabilities. There are a lot of biological problems that we don't know how to solve today. In that respect, if one were to do what you're proposing and try to advance the defensive side of this, I don't know that, what one would do, would necessarily be that different. Because there are just fundamental capabilities that we would presumably need to have, that we don't have today. By trying to solve current human diseases, you're probably also pursuing something pretty close to the best steps to solve the potential diseases that malicious actors could cause in the future.

Dwarkesh Patel
That makes sense. Zooming out from bio risk in particular, how are you thinking about AI these days?

Patrick Collison
Everyone has to be highly perplexed, in the sense that the verdict that one might have given at the beginning of 2023, 2021, back, say, the last eight years — we're recording this pretty close to the beginning of 2024 — would have looked pretty different.

Maybe Gwern might have scored the best from 2019 or something onwards, but broadly speaking, it's been pretty difficult to forecast. So the basic position to a first order has to be some degree of humility. As your blog post identifies, the big question right now is: "To what degree scaling laws hold?" And if they hold, then what exactly is it that we're, asymptoting is maybe a presumptuous word, it's not an asymptote, but what is it, that we're approaching? We don't necessarily know the shape of that thing, whatever it is. How one should feel ought to be very sensitive to the exact parameters of those curves, and I don't think anyone knows what the true value of those parameters actually are. It's clearly going to be important, is already important today, it has a pretty central bearing on both Stripe and Arc. We'll see.

Dwarkesh Patel
I totally agree with that general sentiment but I wonder if the meta lesson that we got from COVID, for example, and with things like Fast Grants was: you obviously can't predict these things in advance, but the most important thing, in addition to specific countermeasures you are trying to come up with in advance, is, when the crisis is happening, having competent individuals who can synthesize and organize information, and also having new initiatives and institutions to get the right thing done.

Patrick Collison
The adaptability premium is probably going to go way up over the next decade.

Dwarkesh Patel
Yeah. With that in mind, I know you already have a couple of day jobs, but I feel like something similar to fast grants, when the time comes down to it, should be there. You'd be one of the top people you could think of, in terms of having expertise and respect in a wide range of domains and competency as a leader. Just keep it in the back of your mind, maybe in the middle of your mind, given how far we are into the transition.

Patrick Collison
Well, Fast Grants was three beloved squirrels in a trench coat. I was one of the squirrels. It was also Tyler Cowen, who's an amazing person and a great friend, and then my wife, who's also one of Arc's co-founders. Fast Grants was not this giant, impressive, office that would qualify me for anything at all.

Dwarkesh Patel
But it isn't hard to be giant, right, to have that kind of big impact.

Patrick Collison
As an objective matter, that's true. John and I try to be very self-aware of the limits of our expertise, which are very proximate to us. I'm sure if something like that was necessary, that'd be.

Look at Operation Warp Speed! They chose a super effective domain expert, Moncef Slaoui, to run that and it was monstrously successful, truly remarkable. I don't know who the Moncef Slaoui of the problem is, it would depend on the problem in question, but my recommendation would be: "Figure out who Moncef is and go hire Moncef." I think anybody who deemed me the Moncef of that thing is probably mistaken.

Dwarkesh Patel
I think you're being too humble. Staying on Fast Grants, now we have the retrospective of how effective the fast grants recipients were, compared to the other grants that were given out by, let's say, the NIH or NSF. To your knowledge, what has been the reaction of these institutions to the discrepancy between the speed and effectiveness of fast grants? Have they analyzed their protocols and what happened during COVID? Is there any retrospective there on their part?

Patrick Collison
Not to my knowledge, but I don't want that to sound like an indictment. Maybe they've done a lot of reflection, and I just don't know about it. I don't think I would know about it, even if it had happened. So, I don't know. I don't know anything about the response at CDC or FDA or NIH or NSF or any of the relevant organizations or their international equivalents. So what I'm saying should be taken as not only not critical of them, but not even as a comment to them. I just don't know what they did.

In general, organizations are not awesome at self-reflection. I assume as a default prior, that some of the dynamics we discussed at the beginning of this are rooted there. None of the people who started those organizations are there today. What exactly are the incentives of those leaders? It's not clear to me who would have the incentive to really take stock in a fully objective and self-critical way, to figure out what was done well and what was done poorly.

Dwarkesh Patel
I promise not to be too myopic about AI, but one more question. Long-term, we can't forecast. Maybe even medium-term, we can't. But near-term, it looks like we might have things that look like AI agents, and they might need to trade. What does the financial infrastructure for AI agents look like?

Patrick Collison
That's a really interesting question. Automated or autonomous transactions already exist to some extent today. Lots of services have usage-based billing, right? A lot of the expenses being incurred are autonomously incurred. No human is pushing a button when Stripe does most of what it does with cloud computing and incurs some cost with some cloud service. In an extremely primitive way it's happening today. I assume it will follow some gradient, where some of those decisions will be made by an LLM or LLM equivalent. There'll be an

almost unnoticeably smooth continuum up to very considerable degrees of autonomy. It's not that we're going to wake up some month and be like: "Oh my god, suddenly the bots have been unleashed." This will now sound very parochial and maybe I'm getting excessively tactical, but there'll be very interesting questions around the legality of bots in terms of: are they treated as the responsibility of the owner? Is there any degree of independence granted? How does liability work? Which rails are best suited? What kind of transaction velocities are we talking about here? Because if it's a billion transactions a second, then the properties of that system should look very different to one giant tiering transaction every day. If we just use the analogy of the usage-based services, those tend to incur liabilities in tiny increments, but then to settle on a monthly basis when you pay your bill. So maybe these agent transactions will have that character. There are a lot of practical applied questions, but I think what you're saying around these autonomous transactions conceivably being an important dimension, is very true and real and is one of the interesting ways in which the economy might change and expand over the next decade.

It's possible that the crypto plays some role here. We take KYC and AML very seriously for humans: we want to know the human that is associated with some particular financial activity. Obviously, that's a murkier question in the context of some AI agent. If we, in some blurry sense, look at crypto as the part of financial services that is de facto exempt from AML by design, then maybe that plays a role.

Dwarkesh Patel
How long before Stripe was founded do you think a product like Stripe could have been invented?

Patrick Collison
That's a good question. Depending on what exactly you define Stripe as being, conceivably decades earlier in that, at some level, PayPal is a kind of Stripe. There were many payment companies before PayPal. You could go all the way back to cash registers, so it depends on definitional questions. The particular secular tailwinds that we benefited from were tied to the rise of app stores, the on-demand economy, and maybe the startup boom post-YC and the financial crisis; those particular tailwinds were idiosyncratic and specific to Stripe. The GFC was 2008 2009 and Stripe was founded in 2010, so as much as you define those as being core, then not that much earlier. Mostly my story of Stripe is one of market inefficiency. I do wonder why much of this didn't happen sooner.

Dwarkesh Patel
I always find it really interesting when there's cases, where it wasn't even the case that: "Well it could have been started sooner, but there was nobody in the market." There were many people in the market. And they weren't just random people, they were technology companies headquartered in San Francisco who were in the market. Do you have some explanation for why it didn't occur to them?

Patrick Collison
I'm hesitant to generalize too much, because I only have maybe n equals 1 experience. It's dangerous to over extrapolate from that. Maybe n equals 2 now with Arc, as a very different kind of organization, but an organization nonetheless.

Dwarkesh Patel
Or if you include all the features of Stripe, n equals 10, 20 something.

Patrick Collison
OK, yes, depending on your definition, maybe there's some kind of samples out there. My general view is: "For most products and most businesses, things can just be done much better". Moats are typically overrated. The payments are a great example of a domain where, on a logical basis, you would say that there are so many sources of defensibility: there's the network effects of the account holders, the data network effects/economy of scale for fraud, regulatory modes and barriers etc. etc. And yet, not only does Stripe exist, but there are lots of others. There's a whole fintech ecosystem today, right? It gets down to deep questions of: "What is the binding constraint on the number of effective organizations that exist in the world?" For any given sector, why is it that number of companies rather than twice that number of companies and so on? It's about motivation, ideas and people's willingness and determination to organize talent and so forth. But these are kinds of more sociocultural explanations.

Hamilton Helmer is probably the leading scholar on various sources of defensibility for businesses. He has this niche, but very well known in the niche, book called Seven Powers. It tends to disaggregate the various sources of market power in this respect. I think that is true and important, insofar as it goes. Nonetheless, it's kind of strange to me that nobody had done Stripe before Stripe.

Dwarkesh Patel
When you think about the fact that moats are overrated and just doing the thing is underrated, what is Stripe's mode in that context? Does that make you think differently about Stripe's mode?

Patrick Collison
Yes, I do think that one can have organizational and cultural moats. Maybe this contradicts what I was just saying, or it's consistent with it in the sense that it's a kind of cultural explanation. In as much as we have a moat, it's because we have a very good understanding of our domain. We have a set of people who actually care about solving the problems, who are continually paranoid at the prospect that we might be forgetting something important. So we are trying to figure out what the important thing that could supplant Stripe's approaches is, and make sure that we build that first.

You're familiar with Conquest's laws. There's Conquest's third law, which is that: "One should model organizations as if they're run by a cabal of their enemies." Presumably it's tongue in cheek, but it's interesting to try to think: "Well, what is the kernel of truth in that and why would it be there?" I think what's going on is: most organizations, when they start out, are actually trying to achieve their stated goals. Somebody started the organization for a reason and probably it was for the stated reason. But then over time, that person and that set of people who initially populated the organization depart and some set of new people come to take their place. And there's multiple iterations of that, there's generational turnover on a continuous basis. But say, for the fifth generation: Why are they there and to what degree do their particular incentives align with the originally stated goals of the organization? There can be a lot of misalignment there, where they're following a local path, conceivably even the leader of the organization does it, not necessarily through any fault of their own. They're human and they have their own incentives and again, the original, constitutional incentives of the organization might be quite different. This phenomenon is a fact of life and for me these kinds of explanations are much more useful in trying to figure out why some of these things either happen or don't.

And to your question: "In as much as Stripe has a moat, what is it?" Others can judge to what degree it's actually manifested and rooted in practice. I think it is, but I'm a biased observer. I think it would be, that people at Stripe really care about solving the problems that we say we are trying to solve.

Dwarkesh Patel
Yeah, the point about the misalignment over generations or over time is interesting. Do you have examples of institutions, which have for decades or centuries managed to keep their original, not only mission statement, but organizational competence? Because if you think of tech companies, even the oldest ones have not been around that long, right?
And they're some of the biggest tech companies in the world. And the median age of the corporation is famously low. What is a good example here?

Patrick Collison
Some of the explanations around the effects of shareholder capitalism suggest that it influences the incentives of organizations and their long term fates. Those theories have some credibility and it's plausible that shareholder capitalism even attenuates the duration of some of these organizations. I'm not saying that's definitely true, but I find the idea that it could be, incredible. It's unclear if that's necessarily bad if it is true, right? In that, are we on the side of the humans, aggregate innovation in the world, or corporations, or quad legal entities? The answer isn't clear to me. It should be the third.

At the same time, if you look at Europe or places like Denmark, because of the tax code there, a lot of organizations are either controlled or substantially held by non-profit foundations. For example Novo Nordisk – the GLP company, Maersk – the shipping

company, I believe also Lego. A lot of these corporations are controlled by foundations and usually have a lot of their stock held by them. In many cases that has the secondary effect, where they actually embed their mission into a legally binding constitution. I'm not an expert on Novo Nordisk, but I happened to get a book about it over Thanksgiving and there's also a book on the Danish Industrial Foundations. It's enshrined in their constitution that they have to make insulin broadly available and really cheap or at least that is the case in Scandinavian countries. So it is allowed to charge market prices elsewhere but they're legally obligated to reinvest profits in R&D. Is that somehow causal in the fact that they made one of the most remarkable pharmacological discoveries of the last 20 years: GLP-1 agonists? – Plausibly. These questions of "Why is it that the median age of organizations and corporations is what it is?" are definitely interesting and I suspect the reason is somewhat dependent on the way we've chosen to organize large corporations in the US today.

Dwarkesh Patel
The thing you're mentioning about this firm seems very similar to the export-led growth in Asia.

Patrick Collison
Totally.

Dwarkesh Patel
The idea of tariffs. There's one company tasked with making the cars, so you better make the cars good. You have no competition but you have to invent the best car in the world.

Patrick Collison
Yes, we are all fans of Smith, Ricardo and even they are less dogmatically attached to free trade than people today interpret them as being. People like Friedrich List and other, not quite contemporaries, but quasi-contemporaries are underrated on a relative basis.
As much as you believe the kind of sociological, cultural skill, even vague alignment in the more interpersonal sense, in as much as you think these are important and explanatory, then you end up thinking about some of the things the US raised.

Dwarkesh Patel
That's really interesting to hear you say that, because if you think about Stripe's mission – it's to facilitate global trade, to make sure that some firm from India can compete with any firm in Nigeria or whatever. So the room for you to have this sort of learning curve where you're less efficient than the global competition should be less, if Stripe exists, right? Isn't Stripe the anti-List company?

Patrick Collison
Well, it depends which version of List. To be clear, I'm not specifically endorsing these tariffs and trade barriers. The history associated with them is checkered at best. Look, it's possible that if you have a specific sector where you have clear goals, a credible path to actually achieving some substantial degree of success and some conjoined propositions, then some degree of activist trade policy might be the beneficial thing to do. I don't think that that describes most sectors in most countries at most times.

Dwarkesh Patel
That's so interesting. I think there's an interesting thread here in how it relates to Stripe climate, in that you're subsidizing learning curves that East Asian countries did for their own internal companies. You haven't picked out a specific company that's going to necessarily be the key to carbon sequestration. How do you think about this?

Patrick Collison
Well, a way to unify the two points, and I'll speak about Stripe in a second, is Say's law about demand creating supply. In as much as Stripe aggregates more and more global demand, it seems too self-aggrandizing to call it "The theory of Stripe", but some vague hunch in Stripe is that this aggregation of demand can have important expansionary effects with respect to the ensuing supply.

Stripe climate is some version of this hypothesis, applied on a much smaller scale than Stripe itself, but still real and maybe important. For folks who aren't familiar, which I assume is most of your audience, the basic idea goes like this; We observed in 2018, that everyone seems to agree, that carbon removal will be very important. Even if we decarbonize the economy on the most optimistic timeframes, there'll still be an accumulated stock of carbon, which will be a problem. It sounded pretty weird, that there were virtually no carbon removal companies in the world in 2018. Maybe there were two or three. No companies had ever purchased from carbon removal companies, which were really sort of science projects. So we thought: "Well, somebody's got to start and it might be valuable to not only transfer some dollars, but to confer some credibility on this sector." Not that Stripe is the world's most credible company, but it's better than nothing. So we started contracting with some of these carbon removal companies. That went pretty well and they seemed kind of appreciative of us and so we thought somewhat more about this.

Then, in 2021, we formed Frontier, which is an AMC, an advanced market commitment. That was inspired by the first AMC, which was a pre-commitment to purchase vaccines for developing world's countries for diseases that were market failures, where either pharma companies hadn't pursued the vaccines, or where the profits weren't sufficient to pay for the program. So we decided to do this for carbon removal. We raised a billion dollars. Stripe was the first investor. We're not actually investing, we're just buying, so we were the first company to commit. Then we were joined by Shopify and Alphabet and Meta and JP Morgan

and a bunch of other companies. And now there's a fairly active sector of carbon removal companies.

Frontier has contracted with between 40 and 50 companies, the overwhelming majority of which didn't exist when we started out with this. We ran an anonymous survey back at the end of last year, where we asked them to what degree was the existence of Frontier causal in their starting the company in the first place. Again, it was an anonymous survey. I think it was 74% of the companies that said that Frontier played a causal role in their starting the company. So these inducement effects can be pretty significant.

Dwarkesh Patel
Yeah, that's huge. What are other ideas you've come across, where an AMC would be an effective instrument of moving forward the tech?

Patrick Collison
That's a good question. We've been having that discussion internally. It's not that we plan on doing it ourselves necessarily, but I'm wondering: "Are there people we should share our technology with?" Not even technology per se, but share our experience and try to help along. There's still a lot of stuff in the biomedical fields. Patents are pretty useful insofar as they go, but there's a lot of innovation that seems socially beneficial, that patents don't provide a way to cover the cost of.

There was some excitement a few years ago about mannose, which is a sugar. There was one or maybe a few papers that suggest that maybe tumors will selectively take up mannose rather than glucose, but they won't actually metabolize it properly and they'll just die. Maybe this could be an effective onco-treatment.

Mannose is like a generic sugar. It's been understood for more than a century and, importantly, you couldn't patent it. So it's not clear who has the incentive to even fund the work to test, whether or not this would actually work in practice. This is not an endorsement of mannose, but there are things of this shape, where there's something that clearly might be very beneficial, but it's not clear how the economic structure of the market can make it possible. There are still a lot of those across the biomedical landscape.

There are still a lot of vaccines that could, in principle, exist that don't, like Lyme disease. There was one vaccine that was withdrawn from the market over safety concerns, that I think were misplaced, but there's still no vaccine.

Dwarkesh Patel
It's not even that well understood, right? People have chronic Lyme disease. We don't know if it's legit or not.

Patrick Collison
Exactly. But it's a good question. Maybe some of your listeners will have ideas for fields, where we sorely need an AMC.

Dwarkesh Patel
I want to go back to Stripe for a second. So you're famously appreciative of craft and beauty, but you also appreciate the power of scale and growth.

Patrick Collison
And speed.
Dwarkesh Patel 01:01:53
Oh, interesting. Is there a type of craft that is just not amenable to speed, growth, scale? If you think of a Japanese chef, he's been learning to cook rice for a decade, and then he can move on to sushi. Is that just not competitive in the modern world?

Patrick Collison
Craft, scale, and speed. I don't know if they are strictly necessarily intentioned in every case, but they're definitely frequently intentioned, so yes is the short answer to that. At the same time, a lot of the most successful companies are those that are distinguished by the extent to which they exhibit appreciation for and skill in realizing craft and beauty. LVMH is one of the largest companies in the world, and that's literally their business. Tesla is pretty good at this. They're good at many things, including this. Obviously, there's Apple. TSMC is not the Japanese sushi chef you mentioned, but it's the TSMC chip sushi chef in Taiwan. They have so much tacit knowledge and difficult to transfer skills. It might be the case that craft and the pursuit of it is as important as it's ever been. Certainly, as Stripe has gotten larger, we have come to greater conviction in this.

Part of what's interesting about these aesthetic qualities is they're generally speaking unquantifiable. I don't know if they're intrinsically unquantifiable, maybe you could train a model to do so, but today, they are broadly speaking unquantifiable. And yet they influence people in significant ways. People very demonstrably care about aesthetics. And if they're a company, they care about the aesthetic characteristics of the products that they produce. On an intuitive level, people know that that's true. But it's difficult to manage that at an organizational level, where there isn't a P&L associated with it, and if you're screwing it up, you don't see a neat time series decline.

Over the 14 years of Stripe, we have, not exactly through trial and error, but by studying cases where things worked well and less well at Stripe, what customers responded well to, and so on, understood, that even in a domain like ours, where we are selling primarily to businesses, that is something that's truly important. Getting back to what we were discussing previously, in as much as the sociology and "cultural" explanations of defensibility are real, the best people consider themselves crafts people in their domain

and they really, above almost all else, want to work with the best other people. It may almost be true, that even if from a customer-facing standpoint, craft was not valued by the market, you might still want to build an organization that indexes very heavily on this, because you just want the best people for other reasons. Now, as it happens, I think customers do, in fact, value it. The evidence is broadly consistent with that. It's very hard to assemble groups of the best people, if you don't take the practice of the work super seriously.

Dwarkesh Patel
What kind of beauty or craft or simplicity is more important— interface or implementation? There's famously that essay that Unix is successful because the implementation is simple and not the interface.

Patrick Collison
The interface is kind of simple, but there's a lot of edge cases that I guess Unix doesn't handle for you.

Dwarkesh Patel
But Stripe does, right?

Patrick Collison
Presumably, it depends what you're building. For TikTok, it's more important that their interface is simple. Even if their implementation is a mess, that's probably OK. Not saying it is, I have no idea. Whereas for Stripe, people are, on some level, purchasing our architecture or purchasing their ability to do certain things rather than some different set of things, because of what our architecture makes easy and possible. If by interface you mean the GUI, then maybe we can draw some separation there. But we don't really draw that distinction. We think of the interface to Stripe as being the architecture.

No one else seems to agree with me, but I often think of Stripe as similar to Mathematica, where we're selling a self-contained universe to model whatever it is of interest to you. We're providing some primitives, interfaces and tools and so forth, to enable your modeling. But fundamentally, we're helping you do something on your own terms. In that sense, I don't think the architecture and the interface are necessarily that separable.

Dwarkesh Patel
That's a really interesting analogy. Although, if you think of Mathematica, the entry that that's giving you to, is just the platonic objects of math, whereas for you guys, the entry is to Visa error codes. The end object is not platonic.

Patrick Collison
That's true. So yes, the analogy falls down in a few respects. But look, the idea of a transaction is pretty fundamental and is roughly as old as the quadratic equation. I guess

the transaction's older. And Mathematica now supports all kinds of crazy, arcane stuff, to a very impressive extent. If you go through the more obscure packages in Mathematica, you can definitely find things that are much less broadly employed and understood, even less than Visa error codes. But yes, these are not the same, It's just that I find it to be an interesting source of intuition. What Wolfram has done with Mathematica is pretty amazing.

Dwarkesh Patel
Another way, in which I'm curious how you think about this, is: one way in which Mathematica maybe differs is, if they had to make a change in Mathematica — "Big deal, somebody has to learn new syntax". If you make a change — billions of dollars of transactions don't happen. How does that change the way you think about the initial architecture and the stakes?

Patrick Collison
It's a good question. First a point on beauty with respect to architecture and then I'll answer that one. Just as a side note, it's interesting that API design in general doesn't get more study as a discipline and as a practice. It plays or can play a significant role in the fate of platforms. Not saying it is always the determinative thing. But if you get it right, there can be compounding positive benefits and the converse. It's really striking that, say with mobile app development, which was one of the most dynamic ecosystems of the past 10 or 15 years, so many of the objects and the classes, say in iOS development, are prefixed with NS. Less so now with Swift, but for much of the iPhone's history. The NS refers to Next app, back from Next in the 90s. When you get API design and architecture right, it can be so enduring over literally multiple decades, even in the face of what are otherwise frenzied evolutions in everything around it.

Unix is another example of this. Yes, Unix has tons of shortcomings, but the architecture has worked now for more than half a century.

We're all trying to impress upon people at Stripe the importance of multi-decadal abstractions. People sometimes respond to that thinking that that's some insanely lofty, implausibly ambitious hyperbola, but no, that's what happens, when you get this stuff right. In fact, if you get it right, people building on your platform can reap incredible benefits for a very long time.

To the Mathematica point, I know they take backwards compatibility really seriously, to the point where you can run programs written 20 years ago, unchanged, in today's Mathematica. That really raises the stakes in API design for sort of obvious reasons. We have that problem ourselves, where, when we think about introducing something new, it's not just: "Does this exigently address the particular need that's motivating it today?" — but: "Do we think we can stand behind this in 2044? How do we think the world might evolve

around us, such that it all remains coherent?" We certainly don't always get that right, but that's, on some level, what we're trying to do.

Dwarkesh Patel
Is Visa an example of this? One might even say, that one of the downsides of being able to use implementation for many decades in the future is, even if it's self-sustainable and you have this ecosystem in equilibrium set around it, if you can't modify it because of people's local incentives, you get stuck in this equilibrium that's worse than it could be otherwise.

Patrick Collison
I see. The card networks generally, Visa and MasterCard, are pretty good at equilibrium. It's easy to judge today with the world as it exists in 2024, but you have to look at the world as it was when they started out and the particular problems that they were solving. When you compare the financial landscape in the US or in the Western world to those in other places, it's certainly not clear to me that the US has gotten a bad hand, so to speak, or is somehow stuck in any meaningful way.

The card networks do a couple of things. Originally, they were designed to replace store credit. It was a credit card originally, not a debit card, right? That was important. The availability of structured consumer credit is a pretty big deal and is beneficial, especially for lower income people. Then, with the advent of jet travel, mass market tourism and so forth, they helped to supplant travelers checks and various worse alternatives, like carrying cash around in your bag. Then, with the internet, they were substantially involved in enabling online transactions. The fact that they got the architecture so right, that so many different use cases were able to be addressed by their core design is really impressive. The guy who designed all this,Dee Hock, was a remarkable person.

People complain about interchange. Lest I sound like a defender of the card ecosystem. You could look at it multiple ways, but many people would consider Stripe to be on the wrong side of the interchange cost equation, in the sense that we're giving away the interchange revenue to other companies. So I don't think I'm structurally biased in favor of interchange, and yet, I will say it's pretty interesting what interchange made possible. It is a distribution incentive fee, where you're paying other entities for recruiting customers, convincing them to get a card, getting them to maintain the card and to pay it off at the end of the month etc. So you're paying for that, just the pure distribution. There's a person at the end of the flight telling you: "Hey, sign up for the United Credit Card!" That's what interchange is paying for.

Dwarkesh Patel
That guy annoys me.

Patrick Collison
We'll get to the counterfactuals in a second. So there's paying for the actual credit issuance itself and then there's the customer support and all the ancillary things around the dispute handling and so forth.

It is interesting to look at the cases where, for whatever contingent reason, the card networks didn't rise. Germany is one of the classic ones. From our vantage point, dealing with the online economy in Germany as compared to the US is so much worse. If Stripe could push a button and have really broadly adopted cards in Germany à la the US, we would push the hell out of that button. You can look at China, which on the one hand does have Alipay, WePay, WeChat payments, that are really ubiquitous — in that sense, they're very digitally enabled from a transactional standpoint. On the other hand, those products tend not to be as sophisticated with consumer credit. So yes, the transaction fees for transferring your money — that's super cheap, but you need to look at it on a fully loaded basis, where: "OK, but what about the cost of actually getting the credit to make the purchase in the first place, as a credit card would enable?" And as you look at these other counterfactuals in other places, one feels gratitude for what it is, that Dee Hock and Visa and MasterCard and the card networks made possible. I'm not saying they're perfect, that one can't make critiques, but I'm most interested in critiques from people who've really studied the ecosystems of other countries, because it's easy to underestimate what we got in their invention.

Dwarkesh Patel
Maybe there's a Chesterton's fence kind of thing going on here. If you had to design payments from first principles now, does it make sense that all these things you've mentioned: taking on credit risk, the chance of fraud, dispute adjudication, should that cost 2% or 3% of each transaction that happens in the economy? What would payments look like if you had to design that from first principles?

Patrick Collison
We're seeing a live version of this experiment play out for the first time in many years in a number of countries today, where central banks are becoming more active in designing national payment schemes.

PIX in Brazil launched in late 2020. I'm sure you've heard of UPI. UPI was the instigator in this process. It's the central bank payment system in India. And it was tied up with AadHaar and their national identity system and so on. That inspired a lot of central bankers in other countries to go and build their own UPIs. So PICS in Brazil launched in 2020 and now a significant majority of all Brazilian adults are weekly active users of PICS. Again, even though it launched in 2020. So it just had this incredibly rapid adoption curve. You have Swish in Sweden, There are examples across East Asia, Japan, Thailand, Switzerland.

Central bank after central bank is deciding: "Hey, we should have our version of this." This is a kind of reinvention of the payment system from scratch.

For some weird reasons hard to understand, once you layer in the customer support, consumer protection, fraud prevention, anti-money laundering controls and the credit, things seem to asymptote at around 2% or 3%. It's important to also note that beyond just covering the costs, much of it ends up getting remitted to consumers in the form of rewards, not in every country, but in many countries. If you look at the public reports from various banks in the US, their interchange revenue, where they're getting these delicious fees on every transaction, as you put it, a lot of that is going straight back out the door to the consumers. So it's not clear how exactly one should think about economics. If it's going back to the consumer, should you include that as a transaction tax or is it just like a weird circular relationship? I've not seen any evidence to suggest that the 2% or thereabouts is massively inefficient in the scheme of things. I'm not saying it's the optimal level— maybe 1% would be better, but within some range of 1% to 3%, it's probably reasonable.

As we think about these ad valorem fees and figures, the place where there's even more change at the moment that we find ourselves thinking more about is the changing structure of global tax. There's been a reasonable amount of innovation in the tax domain over the last century: income taxes got pretty high, then we added value taxes, and so on. The new thing, at least in the online context, is jurisdictions remitting or imposing sales taxes on businesses that don't have any "locus" in the jurisdiction in question.

So if you're a podcaster in the Bay Area, hypothetically "Dwarkesh merch store" will have to pay the town of Uppsala in Sweden, which will have a special tax on baseball caps. And you will need to know about that particular tax on baseball caps. And for any baseball caps that you are selling to the Uppsalians, you'll have to collect that amount from the buyer, report to Uppsala, and then eventually figure out how you're going to get that money to Uppsala. Obviously, it's this combinatorial problem of buyer jurisdictions and product types, and then all the different jurisdictions that you have to remit the money to.

As to those amounts, we're not talking three basis points — the taxes in question are often 5% or 10%, so it's not trivial. As I think about the funds flows on the internet and how all that's evolving and unfolding, I think changes in tax law are actually a much bigger deal than anything about the transactional economics.

Dwarkesh Patel
By the way, it's not the Dwarkesh podcast, it's Lunar Society Podcast LLC registered on Stripe Atlas. Any merchandise I sell in the future, Stripe will take care of that.

Patrick Collison
Yes, OK. If anyone has Stripe complaints.

Dwarkesh Patel
No, it's great, It has been super useful, honestly. It would have been much more difficult to get business operations going.

Patrick Collison
Sorry, I know you're supposed to be interviewing me, but did Stripe play any, even on the margins, counterfactual role in you charging for anything? This is the thing we're always interested in. When we talk about growing the GDP of the internet, it's not like: "Get the existing GDP onto our rails", — it's sort of: "Where on the margin can we cause there to be economic activity that isn't already occurring?" So yeah, you did, in fact, start the podcast before incorporating, but were we causal in any fashion in the merch or anything of that nature?

Dwarkesh Patel
To the extent that Substack would not be a convenient place to get payments from to begin with, that's definitely a thing. And also...

Patrick Collison
You wouldn't charge for the newsletter if Substack hadn't made it super easy?

Dwarkesh Patel
Yeah. And also, if I do an ad, I wouldn't even know how to begin with getting the money, if I didn't already have an LLC through Stripe with the dissociative bank account, that I'm going to get the money through. So yeah, probably counterfactually responsible for a lot of the monetization.

Patrick Collison
That's cool.

Dwarkesh Patel
Appreciate it. What are some unexpected complements to payment processing you see in the future? All this stuff: Atlas, identity fraud, detection — in retrospect, it might not have been obvious back then there was a good complement, but now it does seem that way. What would be like this in five, 10 years?

Patrick Collison
Honestly, our problem ends up being that more things then we could possibly pursue, look like complements. In that every business almost by definition has revenue we obviously want to help them generate, accept, manage and orchestrate everything pertaining to that revenue. But once you're in that flow and you go through the steps of running a business, a lot else looks relevant and somehow connects quite directly.

When Stripe started out, it definitely wasn't cool. It was the opposite, it was just a couple of us and we thought that we could make this superior payments API. For the vast majority of its history, Stripe has attracted people who are drawn to unglamorous infrastructure challenges and problems. We're not a company that specializes in making beautiful cars — we make roads. I bring all of that up, because it's relevant to this complement question, where in our discussions internally, a lot of it, probably the significant majority of it, is still about: "OK, where are there practical shortcomings and limitations in even our core bread and butter?" Payment processing might be a slightly too limited term to use for us. It's more about global programmable money orchestration, which, yes, is consumer to business payments, the sort that we were just discussing in, say, the context of your Substack. But it's also business to business payments, payments where there's credit or lending involved. It's also how you hold money, how you convert money between different currencies. It's how you represent money that's held by different legal entities and how we make it possible for even individuals or small businesses to act as micro multinationals.

But those problems that we just skimmed over, even though they all directly pertain to the movement of money, they're not small. If we could just solve those really effectively, then Stripe will be a very consequential organization and force in the world. The counterfactual importance of building some of this stuff, as we go to newer markets that are, on a relative basis, more poorly served, is increasing rather than shrinking. In the US, there were payments companies before Stripe and maybe, if Stripe had never done its thing, eventually you'd have found some way to monetize a newsletter or something like that. But if you're in Albania, the set of options available to you is far more restricted. The marginal impact as we expand globally increases quite a bit. Even though we are interested in and do pursue some of these direct adjacencies today, the core problem of global money orchestration remains really big and unsolved.

Dwarkesh Patel
Does that look like being a better interface for all these complexities and glossing them over under the seven lines of code? Or does that look like replacing the rails and the infrastructure to make all this more efficient and effective?

Patrick Collison
The former. It's not that useful to build financial ecosystems, that are self-contained. A financial island is not that helpful. It's much more valuable to build a financial, this is mixing metaphors, but a financial "air network". We would much prefer that Stripe plugged into every existing system, rail, domestic organization, rather than that we tried to come along and supplant them. And this has been Stripe's strategy very deliberately from the beginning, where there were lots of companies, when Stripe started out, that were trying to do their own thing and go their own way, whereas our belief was: you get these classic Metcalfe's law stuff — by enhancing the capabilities of an existing ecosystem, you create quite a bit more value.

Dwarkesh Patel
OK, let's go back to Stripe. Is Stripe a writing culture for the benefit of the writer or the reader?

Patrick Collison
It can be both.

Dwarkesh Patel
But which one is the more so?

Patrick Collison
There are really considerable benefits on both sides, because for the reader, it's not just that it's maybe more efficient to communicate stuff through text, though in many cases it is, but also there's intertemporal benefit, where future readers can try to understand the through line and the thought process that led us to this point. And that's very considerable.

But it's also true that I and lots of people write things in order to organize one's own thoughts. If that ability was taken away from me, I'd be meaningfully less effective. How exactly those bounce out is hard to say.

They're not actually separable. That's my answer. Literate cultures are just a different thing. I don't mean literate in some kind of faux intellectual way, textual cultures is a better term here.
Bruno Latour spoke about how he thinks the printing revolution, like Gutenberg's, partially caused the scientific revolution by making knowledge more rigid. Before, if some observation didn't match some claim, you could always shrug and be like: "Well, the person who transcribed that thing made a mistake." So by making things more rigid, it's easier to break them. Then you can notice discrepancies between the theory and the reality. There's some version of that organizationally, and I'm not drawing a precise parallel, but there are analogous dynamics, where the nature of oral cultures and textual cultures are just quite different. The kinds of collaboration that are possible, kinds of consistency, that can be achieved, are just fundamentally different. Is the front or rear wheel of the bicycle more valuable? Theoretically, you can be a unicycle, but as a practical matter, you do just need both.

Dwarkesh Patel
I know I said no more AI questions, but on this particular point, it seems very legitimate to me, that you might expect firms, that have a lot of writing, to be the first to experience the productivity gains of AI, because in other cases there's all this context that the model doesn't have readily available. I don't know if that's something you anticipate.

Patrick Collison
That's probably true. Yeah, I don't know. If the model is really good, maybe it's able to pick stuff up quickly. Most organizations are not recording all of their meetings for a variety of reasons, and if they're not, then there is this question of: "What is the corpus? How do you get up to speed?" So yeah, my guess is that will be true.

Dwarkesh Patel
Tell me about the internal LLM you built.

Patrick Collison
Oh, we didn't build an internal LLM, we built an internal LLM tool for making it very easy for people to integrate LLMs into production services, but also into their regular workflows as humans. We added the ability to work directly with the LLM, as a standard chat agent, as lots of people did, but then also to integrate that with some of our tools for querying and accessing data, most interestingly, we added sharing prompts across different people, so that somebody might discover these prompts. One of my favorite examples is: somebody put together a prompt for optimizing SQL queries. It doesn't always work, but sometimes it does. It's very cheap to ask us: "Got any ideas for optimizing the SQL query?" And sometimes it will come up with some good stuff. So the collaborative abilities there have proven surprisingly high return. And then having, lots of organizations have this — we're not claiming that it's very novel — but having a central bus through which to route all access to these LLMs, in such way, that we can experiment with different models and have some degree of observability into the respective performance trends and the usage of different cases. We have found building a fairly significant amount of production infrastructure around LLMs to be valuable. And now, given the proliferation of LLMs themselves, with all of the obvious contenders, this is proving quite valuable, because we're able to try to figure out for different use cases which models: self-optimized or who knows which, are most effective.

I don't know what the total number of invocations is, but I think we're making millions of invocations per day now. There are dozens of dozens of actual production use cases across Stripe. The financial services ecosystem is, in some way, a giant analog to digital exercise, because humans, intentions, identities are analog — all these things have some degree of uncertainty around them and some noise. But then transactions are digital, right? And we often find in these analog to digital conversions, that LLMs can be a surprisingly interesting augmenting tool.

Dwarkesh Patel
On that point about the flexibility and the edge cases in the way humans interact with these systems: in some sense, Stripe is a really high stakes bug bounty program, right? If somebody hacks it, if there's reliability issues, not just because of a hack, but because you deployed the wrong way, not only the financial services— obviously, money's in play— but a

significant percentage of rural GDP would grind to a halt, at least while it's down. How do you deal with that kind of responsibility? How do you keep the uptime and keep the reliability while deploying fast?

Patrick Collison
This is one of the things we've spent the most time on. Back to this point about wanting to be the place with the best people and the value of focusing on craft, so that you can have the best people. In the context of software development, two things developers hate: slow development cycles: it'll ship in the next release in a month and that kind of thinking. Developers also hate being paged at 2 AM for incidents. So, given the criticality of the businesses that we serve, which is, in rough terms, 1% of the global economy — it's not totally clear how to measure this, because GDP is defined as final goods and Stripe is not only selling final goods, so, in theory, there could be a bit of double counting. But Stripe is mostly selling final goods. We're not used, by and large, for giant supply chain shipments. Maybe there's a mismeasurement of 10% or 20% or something. But long story short, I think it works out to about 1% of global GDP. It's about a trillion dollars a year. As you say, that then makes us really terrified of outages.

And so we work so hard to enable fast iteration and development cycles without having outages, and to put some numbers on it: we deploy production services that are in the core charge flow around 1,000 times a day. Most of these services are automatically deployed, so when anybody makes any production-ready change, it just goes into production. It's meticulously and carefully orchestrated: first is just running some small sliver of traffic and then incrementally more traffic until it's everything. So about 1,000 deploys per day at roughly or somewhat in excess of five-and-a-half-nines — 99.9995% reliability — which works out to about two, two and a half minutes of unavailability per year.

It's not that we have, obviously, two and a half continuous minutes of unavailability, but that's what it approximates to, even though it tends to happen as background radiation throughout the year. Getting to that point takes a huge amount of investment. Then there are security properties that are less readily measured, but analogous to those figures. Silicon Valley doesn't tend to... I'm perhaps now being unfair in attributing things to Silicon Valley — a lot of the tech industry doesn't place a lot of value on process and operational excellence. We culturally value the spontaneous, the creative, the iconoclastic, the path-breaking. Building mechanisms that can enable the very reliable provision of important services at scale, and removing the sources of variability, that can really cause a bad day for a very large number of people — I don't think these things get quite as much cultural credit.

None of this sounds like rocket science, but defining what it is, that we care about, and then building automated measuring systems to measure to what degree it's happening in practice, to then try to figure out the cases where we're not living up to that, and determine

what is the reason, then to actually intervene and improve the system, so that that's not happening, then importantly, to build secondary controls, that detect instances of deviation long before they cause a production problem, but where we understand the behavior of the system in sufficient detail, so that we can instrument it in some upstream way — most of what I said there was well understood by production engineers in 1930s.

So again, I'm not claiming that it's any kind of radical breakthrough, but we have found that the adoption of these practices in really tenacious multi-year form yields really high returns. There may be other organizations that both ship at that rate and maintain that developer velocity at this combination of scale and reliability and security, but I don't think there are that many. It's a real testament to the remarkable folks at Stripe who made it happen.

Dwarkesh Patel
Last point, the fact that you have this huge internal tooling and testing is... Once you get the AI engineers, they can push the commits and you have the infrastructure set up, so that it can be readily evaluated.

Patrick Collison
Yeah. Across the board, so much comes back to what has to be true for us to be able to build and to take seriously this goal of building the best software. It's easy to say that as some lofty, vague, hand wavy aspirational statement. But if you take that seriously as a goal — you think about what you would have to measure, if you were actually going to pursue it in earnest? — part are the characteristics of organizations that do produce it. You get down to: "Well, customers have to really like your stuff. OK, how can we measure that? And how can we systematize the process of making sure that there aren't repressions there?"

We have this concept of “experience journeys”, which are pathways through Stripe, that we really care about and that are always implemented at a really high quality level. And it has to be true that developers can iterate over them very quickly — we just spoke about how to make that happen etc.

A theme through everything we've talked about is taking the goal seriously. And I feel like a lot of what we do at Stripe is — again, I disclaim any genius in it — just the very earnest, repeated, serious, and long term application of taking the goal seriously.

Dwarkesh Patel
A few more Stripe questions. One percent of global GDP is such a staggering number. When you think about where further growth for Stripe comes from, does it come from the internet economy expanding? Or does it come from Stripe becoming a larger share of the internet economy? And to the extent that Stripe is growing faster than the internet, if we consider that to be the beta in your case, where is that alpha coming from?

Patrick Collison
That's a good question. The customers that Stripe serves in aggregate are outgrowing the internet economy as a whole. At some point, those have to converge for obvious mathematical reasons. But we're 14 years in and they haven't converged yet. There's a lot of headroom there. Say Stripe is handling around a trillion dollars a year. When Stripe started out, the global economy was sixty to seventy trillion-ish. The global economy is now around a hundred trillion. We still have quite a bit of headroom before the amount of activity that is coming out to Stripe is really butting up against the ceiling of global economic growth. And of course, there's no ceiling on global economic growth for all sorts of reasons. It could be vastly higher than it is. And I don't even mean new technologies or AIs, but just all the basic per-capita math you can do around. What if everybody had an income on par with the US?

One of the reasons I am so interested in working on Stripe is: it's the old line, the Lucas line, about how when you start thinking about differential rates of development in countries, it's hard to think about anything else. Why does Brazil have the particular income and GDP level that it does? Why does Poland have the level that it does? Why did Ireland have the trajectory that it did, where it went from being the sick man of Europe to now one of the wealthiest countries there? I feel like Stripe is some applied version of this question in practice, where you're building software products, but in some sense connected to or touching upon these questions of: Why aren't there more companies? What determines the growth rate of a company? Why is it that when you start the merch store, why does it have X level of buyers rather than 2X? I think those remain fruitful questions.

We haven't optimized the meta system of business to any particularly great extent. For the vast majority of time, businesses have been offline, inefficient, analog. It's really only over the last one to two decades that a significant share of this has been meaningfully digitized. And the prospects for optimizations there are still significantly underexplored.

We find incredibly basic things, like 'just extending capital to businesses'. The reason we do that is not to generate profit from the loans, but because we find that the businesses, whom we extend the capital for, then just grow faster on a persistent subsequent basis.

Or, trying to figure out, how does a business decide which countries it sells in? And you'll find for even the smallest business through to some of the largest businesses in the world, that these are very ad hoc and not deeply thought through questions. Like: "Why don't you sell in Mexico or in Brazil or whatever? — Well, it seemed complicated, and so we didn't quite get around to it."

To your question about: where does the growth come from? There's still an awful lot of low-hanging fruit in just asking some of these incredibly basic questions.

Patrick Collison
So, when we think about the way in which Stripe will continue to grow in the future, in some sense, it will obviously involve a lot of big businesses. You're now processing a significant amount of Amazon volume, there are these other businesses you're doing deals with. First, tell me how you think. It makes sense how an exponentially growing startup would contribute to exponential growth for Stripe. How does Stripe keep growing at the same trajectory, when it's these existing big businesses that you're partnering with? And second, the case for why these startups matter is so compelling, right? A new thing is coming into this world, and we should really support it and make sure it happens. Why is it compelling that Amazon can fulfill orders more efficiently?

Dwarkesh Patel
Those are very good questions. On the first one — you're right. Stripe is doomed to eventually grow at the rate of the economy, there is only a question of how long it takes to get there.

Patrick Collison
Right.

Dwarkesh Patel
The good news is that it can be a very long time, because there is, as we just discussed, so much low hanging fruit around different improvements that are possible. So I think it'll be many decades before that happens. But it's true: that will eventually occur.

On the second question: "It's obviously virtuous or compelling or exciting to foster all these nascent startups and to be an anti-incumbency force. But what's the case for supporting established businesses?" People misunderstand that for a small business, typically, at least in the cases where we denote them startups, there's usually an embedded innovation. And this innovation is all that the company is. They have a new idea, and they're going to do something better or different etc. Generally speaking, we like innovation and so we have positive sentiments towards that startup. But there's a lot of innovation that comes from large established businesses. That's not all they do, they are also just running the existing thing. So maybe it's a smaller share, but the aggregate fraction of innovation that comes from established businesses is really large. We have to be cognizant of the cognitive bias, of the startups being more conspicuous. On a relative basis, the improvements in turbine, fab or insulation technology come largely from established businesses. To choose any sector of the economy, a significant fraction of the important inventions that occurred over the last 10 or 20 years will have come from the incumbents.

As a general class, and Tyler wrote a book on this, big business is underrated. If you look at the survey data, people tend to have very positive sentiments not only towards startups, but towards small business as a class. Even though they have negative sentiments or

relatively negative sentiments towards big business, it is not that bad on an absolute basis, but not as favorable. It's true that established businesses tend to pay better, tend to be more efficient, more of the innovation in our economy comes from them and they produce a lot of consumer surplus.

The specific case for Stripe working with them is: typically they're coming to us not because they want to take the thing that they're already doing and go through all the work of transposing to Stripe, but because either they want to do a new thing, that they're not doing today — so it is associated with some new business line or innovation or invention. Or they've spotted the opportunity to produce a new product and want to meaningfully change how they provide an existing one in a fashion that, again, yields consumer surplus. That sounds very abstract and theoretical, but in practice, it tends to mean they want to take what they're selling in this market and sell it in many more markets. Or they've realized that they're selling it in this modality, and they should sell it in other more convenient ways, like on mobile or something. In each of those cases, if it's successful, if people buy it in significant numbers, we're getting this decentralized signal from the economy, that there's now something of value being provided, that wasn't heretofore.

As I take stock of the businesses, the enterprises that are in the process of migrating to Stripe or that did so over the last year, whether it's the large retailers, global manufacturing firms or shipping companies, it typically has one of those two patterns. New product or current product sold to people who weren't buying it before.

Dwarkesh Patel
Yeah. If you think about the big trends in society that are needed to solve our big problems, like Moore's Law or the cost of solar, you have marginal improvements over many decades.

Patrick Collison
Yes.

Dwarkesh Patel
Big tech or big companies are just able to invest a lot of money into doing the R&D.

Patrick Collison
Relentless iterative improvement, yes. It's underrated.

Dwarkesh Patel
Can I ask about John for a second?

Patrick Collison
Sure.

Dwarkesh Patel
You guys recently published Poor Charlie's Almanac and subsequently, Charlie Munger has passed away. Did Munger ever comment on your relationship and if or whether it reminded him of his and Buffett's?

Patrick Collison
Not to me, but he knew John better. So it's possible that he did to John. Yeah, I don't know.

Dwarkesh Patel
What have you learned about marriage from John? This co-equal, intense, lengthy partnership — the closest thing to that you have is marriage, right?

Patrick Collison
Well, I'm relatively new to the practice of marriage. So maybe in a decade I'll be able to extract the generalizable commonalities. The general thing I'd say is: working with people you're close to is underrated. I'm doing Arc with Patrick Su and Silvana. Fast Grants was with Tyler and Silvana. Stripe is obviously with John. I should mention, John was also instrumentally involved in Arc's formation. It would not have happened without John. I could give more examples, but I feel like all the ventures of any significance in my life, have not only been with others, but been with other people that I'm very close to. I had and would like to have an enduring relationship that outlives these ventures.

Sometimes one hears the advice that you shouldn't work with friends, maybe you shouldn't work with your partner or something like that. All these things are idiosyncratic and there are instances of every possible permutation. But for me, it's been a really rewarding experience. And I think John and I can work together for... You never know life, but I think we'll probably work together for decades. For us, it's been both an important source of meaning and, again, fulfillment, but also there's a real complementarity. Stripe would be a less effective company without either of us. And I'm just meaning from a bandwidth standpoint, but I think we both bring different things to bear.

Dwarkesh Patel
Patrick, I think that's a great place to leave it. Thank you so much for coming on the podcast.

Patrick Collison
Thank you.

Dwarkesh Patel
Hey, everybody! I hope you enjoyed that episode. As always, the most helpful thing you can do is to share the podcast. Send it to people you think might enjoy it. Put it on Twitter, your group chats, etc. It just splits the world.

Appreciate your listening. I'll see you next time.

Cheers.