Recursion Pharmaceuticals

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Tom Slater (TS): It's a fundamentally different model to trying to discover medicines.

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TS: Moving at that speed in an industry which is used to taking its time is really unique.

Claire Shaw (CS): Hello, and welcome to Invest in Progress, a podcast brought to you by the Scottish Mortgage team. I'm Claire Shaw, a director and investment specialist. This podcast is designed to give you a behind-the-scenes look at the conversations that take place between our managers and the visionary founders, entrepreneurs and business leaders of some of the world's most exceptional growth companies.

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Today, we're talking to Chris Gibson, Co-Founder and CEO of Recursion Pharmaceuticals. Founded in 2013, Recursion uses machine learning to revolutionise the pharma industry by developing a faster, cheaper and more successful approach to drug discovery.

So here with me in the studio today to discuss Recursion is Scottish Mortgage Manager, Tom Slater. Hi, Tom.

TS: Hi.

CS: So before you chat to Chris, let's set the scene a little bit. What is it Recursion does? What makes them unique?

TS: So Recursion is a drug discovery company. They make medicines for people. And the interesting thing about the approach is that whereas traditionally, drugs have been discovered by scientists who have an hypothesis, working at a lab bench for months, trying to get some results to validate that hypothesis, test whether this compound might be effective in a certain disease state, Recursion dispenses with all of that. And instead, what they do is test thousands or hundreds of thousands of potential drug candidates against millions of disease models to see which potential compounds have the most interesting reactions.

And they do this at huge scale, using machine learning techniques to process the results. And instead of starting with a hypothesis and then testing a drug, they just start with all the drugs and then form a hypothesis. And that's important because it means you can move a lot more quickly and with a much lower cost than we've become used to in the traditional industry. And the traditional industry in its current form is unaffordable.

CS: So essentially, it's a faster, cheaper, potentially more successful approach to drug discovery. Our guest today is Chris Gibson, one of the Co-Founders of Recursion. Can you tell us a little bit about Chris?

TS: So Chris is an entrepreneur who has been focused on taking a completely different approach to biological drug discovery. In many ways, he's not part of the traditional pharma industry. He works in Salt Lake City. He started the company there, which is not known as a hub for the pharmaceutical industry, and just pursued a very different technology driven path to the whole process of finding medicines.

CS: Tom, you and I will catch up after the discussion, but for now, I will hand over to you and Chris.

TS: Hi, Chris. Brilliant to have you here with us today. Thank you so much for doing this.

CG: Yes, thank you, Tom. I'm excited.

TS: Me too. So let's start. Developing drugs takes a long time. It costs a lot of money. And Recursion as a company wants to change this. So could you just explain why that problem exists and how Recursion are trying to solve it?

CG: Absolutely. So Tom, the process of discovering and developing a new medicine is extremely challenging. It takes over a decade and typically about $2-3 billion of invested R&D to get one new drug across the line. And I think the reason is because biology and chemistry are so complex. We're complex beings.

And we probably only understand 2% or 3% of biology today. There's 20,000-plus genes in each of us encoding hundreds of thousands of proteins inside of trillions of cells, and all of these are interacting every second. There's more potential molecules that could be drugs than there are atoms in our solar system.

So it's just an extraordinarily complex problem, and the tools that we've had at our disposal for the last 40 years in the field have been relatively bespoke and artisanal in many ways. We have really smart experts who have learned how to use these tools. But I kind of think of it as hunting for gold, in a way, and you've got these smart, experienced geologists out walking the plains, looking for the right formation. And the reality is that that just doesn't scale to a problem as complex as solving biology and chemistry.

And so at Recursion, what we're trying to do is leverage technology, things like robotics, things like machine learning and AI to actually take a broader view and start to build maps of biology and chemistry that allow us to hone in on those places where there might be one of these nuggets of gold or a potential treatment much more quickly and much more efficiently.

TS: Why couldn't we do this before? You said we've done it this way for the past 40 years. So what's changed that enables the approach you're taking?

CG: Well, the field of drug discovery really rests upon a whole bunch of different areas of science, from biology to chemistry, and now even to computational sciences. And in all of those fields, there has been a renaissance, an exponential improvement in technologies over the last decade or so, two decades or so.

And I think, oftentimes, fields that operate at the interface of many of these different tools can take a little bit longer to adopt each of these. And so for example, when Recursion was started nine years ago, the idea of using CRISPR/Cas9 to cut out genes was just really at the early R&D stage. It wasn't even a tool that we could harness. We didn't start really using it at scale until 2019.

Even the field of deep learning, convolutional neural networks, while it had been studied for decades, it really didn't start to catch on until just around the time that Recursion was forming. And so we've been operating at the interface of these exponentially improving tools, and I think we're one of the companies best positioned to really leverage all of them together to make advances in this field.

TS: So help people understand better what it is you're doing. When I think of drug discovery, I'm thinking of a PhD student probably at a workbench with pipettes. What's different about the way Recursion does it? And what does a Recursion lab look like?

CG: Yes, absolutely, Tom. So I think you're right. Typically, in the field, really smart scientists read the literature which is published by all the rest of the scientists around the world. They come up with a hypothesis, they build a team, and they go do experiments, often by hand, to try and understand whether that hypothesis is right.

I think at Recursion, we've done things a bit differently. We've tried to leverage our people much later in the process. And so what we've done is taken a large set of robots that allow us to do a huge quantity of experiments. I tell people that we do my entire PhD's worth of experiments every 15 minutes at Recursion.

TS: Yes.

CG: Up to 2.2 million experiments a week. And these are generalisable experiments, where we measure thousands of things as opposed to just measuring one thing

at a time. And we use computational techniques to turn all these data every week, hundreds of gigabytes of data, into maps that give us insight as to how this broader system of biology and chemistry are interacting.

And so our scientists, PhD, they come and join Recursion, they actually jump into a web app and they navigate maps of biology and chemistry to identify new hypotheses that perhaps other people aren't working on. And then they use a lot of our other similar tools, tools built with the same philosophy of automation, scale and computation, to go interrogate those hypotheses more quickly, more efficiently. And ultimately, we think, as we stream these approaches together, we'll be able to discover better drugs at a lower cost at much higher scale.

TS: So it's almost like you have data/AI-enabled scientists, that you're not asking them to come up with a hypothesis first, it's that you're testing this huge universe of possible drug disease combinations, and then the scientists can use AI to identify the most promising ones to go after.

CG: Yes, that's exactly right. And a colleague of ours, they liken this to the advent of the assembly line in the auto industry, where prior to that in the United States, you had thousands of artisanal car builders who were building these vehicles by hand. And what Ford did was build an assembly line to try and increase the efficiency, to make better, more reliable, less expensive cars. And I think we're taking that same philosophy to drug discovery.

TS: Talk me through how the pipeline of new drugs, well, medicines that you're trying to produce, looks different at Recursion as compared to a traditional pharmaceutical company.

CG: Well, first I'd say, for a nine-year-old company with a few hundred employees, we have five drugs in the clinic right now, in clinical trials, which is that last set of steps of testing in humans before you take a drug to market. I think that's a really, really important number, because that far exceeds the vast majority of companies at our size, at our age. So, so far, the hypothesis that we can leverage technology to scale drug discovery is working.

What I'd say is also different about these drugs is that we are not competing to be the tenth or 20th best inhibitor of some specific target in a specific disease with dozens of other companies, which is a product of this approach that the rest of the industry uses, where people read the same literature, smart scientists will often then converge on the same hypotheses, and sometimes you have many companies investing in parallel in the same area.

We're actually focused in diseases where, in some cases, there's no other company working on the disease that we know of at the clinical stage. So one of our most advanced programmes, cerebral cavernous malformation, which probably most folks haven't heard of, it affects nearly five times as many patients

in the US and Europe as a disease like cystic fibrosis. But because the biology was poorly understood, there's no companies with drugs in clinical development that we're aware of. And that's one of our lead programmes here at Recursion.

So you see us working in places where either other companies are not, or, in some cases, if we're working on a disease that other companies are working on, we often have a very different hypothesis, because we leverage these maps of biology to drive us as opposed to a fundamental exploration of the literature.

TS: And so it's because you're starting without a hypothesis and just computationally working out where the most attractive targets are. But I guess the other component of it is the economic one, that if you can bring drugs to market more quickly at a much lower cost, then the types of problems that you can work on and address are different than a traditional pharma company.

CG: That's right. And so just if you look at the industry generally today, about 90% of drugs that go into clinical trials end up failing before they get to market. And what that means is that just the economics work out in a way where most companies are not going after a disease in which they don't think they can make more than $1 billion a year in revenue. And that either means if it's a rare disease, that they have to charge a lot of money for the treatment, or if it's a common disease, that there has to be a lot of people with the disease.

And I think at Recursion, if we could, over the next decade, let's say, just double the success rate so that 80% of our programmes failed, we would open up many, many new diseases where you could actually go for revenue that was much, much lower, which means charging less for your drugs or going after patient populations that are much rarer. And I think that's where many in the field want to go, but ultimately, it's just challenging from an economic perspective to get there today with the tools that most folks are using.

TS: And so as you've come up with these targets, you've chosen to develop some of them into medicines yourself, and in other cases, you've partnered with big companies like Roche Genentech, for example. So how do you make that decision about whether to develop the medicine yourself or whether to work with a partner to do it?

CG: That's a great question, Tom. And the reality is that there are hundreds of steps involved in discovering and developing a new medicine, and we can't innovate across all of them simultaneously, as much as I would love to be able to do that. And so we have selected partners who we believe we can learn from, and we've partnered with them in areas of biology that are really, really intractable and expensive.

So in the context of Roche Genentech, as you just mentioned, we have a decade's long collaboration, one of the largest ever signed in biopharma, to go after the

whole of neuroscience. And neuroscience is littered with failures, from Alzheimer's to ALS. It's a really, really challenging field.

And so we wanted to be partnered with a group of incredible scientists who were excited to use our approaches, to partner with us there, but who could help with the resourcing and the insights needed to even do something like run a clinical trial against a disease of that kind of scale and magnitude. And so we've typically partnered in those bigger areas of biology.

And then, because we eventually want to be a company that in many ways will make our own medicines and take them to patients as one possible end point for the company, we want to be able to build our own pipeline. That's how companies today are valued, especially in the public markets, by many. It's based on the internal assets.

And so we've built our own pipeline, but it's mostly focused in areas of rare genetic diseases or precision oncology, where there's less competition and we think we can probably develop those on our own in the near term.

TS: And where do you think Recursion will have the biggest impact then? Is it in those big categories where you partner, or is it taking the technology to actually address those patient populations that are just massively underserved because it's not economically feasible?

CG: Ultimately, it's going to be across the entire field. And I think that we have to focus on these areas of rare disease initially, from an economic perspective, but I think over time, as our technology improves, we may be able to crack some of the bigger diseases. And our goal at Recursion is to radically improve the lives of as many patients and their families as we can. And so I don't think we feel limited in the diseases we can go after. It's really a question about what order we prioritise, based on the science, based on the resources.

TS: And if you go back to 2019, when I first met you and we first invested, the approach, I guess I would describe it as a sort of brute force approach. You would test this huge library of drug candidates against this huge library of disease states, and basically just find out where, within that picture, you saw the most interesting results.

But you referenced it earlier. Today, you think about building this map of biology and using that to make smarter decisions about where to go after. But could you just explain what the map of biology is and what the implications of it are?

CG: Yes, Tom, that's right. So back in 2019, we were physically testing hundreds of thousands of potential drugs, small molecules, against each disease model that we built. And we were doing this at a scale that was huge. I think it was unprecedented in many ways. But it was still quite limiting, in that if you wanted to test, let's say, a million possible drugs against 10,000 or 20,000 different

diseases, even at millions of experiments a week, there's this kind of combinatorial explosion, and it would end up taking hundreds of years.

And so one of the things we had hoped to be able to do at Recursion from the early days, we were able to transition to in 2020, which is what we call mapping and navigating, where we test drugs by themselves, we test disease models by themselves, and we use the more than 150 million prior experiments we've done at Recursion and machine learning models we've trained across all of those data to then predict how every combination will interact.

And those predictions aren't perfect, but it means we can save an exponential number of physical experiments. We can essentially use an in silico approach to predict what the result would be based on real data. And then we can actually just go do those experiments that we predict will have the highest probability of success.

And what I like about this approach is that we're not always right, sometimes our predictions are wrong, but what we've then done is generated new data at an intersection where our predictions were poor that can then be used to retrain the model to make better predictions in that area of biology or chemistry in the future.

So it becomes essentially a learning system. And I think, over time, we've seen our ability to make predictions across complex biological and chemical interactions get better and better. And that's one of the things I'm most excited about, because if that path continues, it means better medicines.

TS: It does strike me that that's one of the more misunderstood points about Recursion, that it's as you get bigger, you get better almost because of the data assets and the way you can handle those data assets. And that's just not something we've seen in the pharma industry before.

CG: That's right. It's essentially network effects that we've seen in so many different technology companies, but it really has not been a part of the traditional biopharma industry, I agree.

TS: So if you look out over the next five or ten years, what are the biggest constraints to growth? You've got all of these superpowers, if you like, behind the company, but what is it that is going to be the biggest hurdle to actually grow as a result?

CG: So there's three core parts of discovering and developing a medicine, and there's hundreds of steps within this. But one of those is having your biological hypothesis, having an idea about what you want to change in biology to make some disease better.

The second is trying to figure out what you're going to use to actually go after making that change. Is it going to be a small molecule? Is it going to be an RNA?

And then there's actually going through the process of developing a medicine in clinical trials, and there's a lot of work that goes into that.

Recursion chose to focus from the beginning on the biology question. And while we were one of just maybe a dozen companies at the technology-enabled drug discovery stage when we started in 2013, there's now hundreds of companies in this space, but the vast majority have actually focused on the second question, understanding chemistry or understanding modalities and making predictions about those.

We've focused on what we think is the harder zero to one question, which is what target to go after in the first place. Now, the next big bottleneck for us is on the chemistry side. Once we've identified this novel area of biology to go after, what's the specific molecule that we're going to use to make the effect that we want to see in biology?

And I think that's an area of internal investment, both organic growth at Recursion, but also potentially, especially in the capital markets friction we see, I think there could be an opportunity for us to consolidate some really fantastic tools, technology and talent to help us address that. I think we'll address that over the next five years, or earlier.

And then the question will be clinical development and clinical trials, which is a highly regulated space, but where I think there's some incredible ideas, approaches and technologies that people are implementing. I think if we can lay those three things together in one platform and one team over the next decade, we have the potential to really, really shift the industry in pretty meaningful ways.

TS: So we've talked here quite a lot about the opportunity, the technology, the approach. I'd quite like to talk a little bit about what's different about the company, and what do you see as the cultural advantages you have in competing in an industry which has a lot of tradition and a lot of baggage, if you like, from the way drugs have been produced over the past 100 years?

CG: Well, one of the great opportunities and challenges we had in founding Recursion was that the founding team was a physician, a computational scientist and myself, a bioengineer, and only one of us had ever worked on drug discovery as a main focus of our work. And so there was a lot we didn't know. We were aware that there was a lot we didn't know.

But to your point, we were able to start over from a clean sheet and use a first-principles approach to ask, how would you discover a medicine in a better way if you were not constrained by all of these not only scientific but cultural bounds of the way it's been done in the past? And what that requires is a lot of iteration and a lot of change. And so we've built a culture, I think, that's resilient to change.

Every year, we're making a big cultural or mindset shift at the company to take advantage of everything we've learned.

I just had a big all-hands meeting with the company last Friday, talking about the mindset shift that we need for 2023. And we see that as a plus here. We see that as a huge opportunity, where we can have a nimble team who's excited to change. Very, very different, I think, in traditional biopharma companies, where, for good reason, people have learned lessons over decades, and it's very, very hard to get them to shift their thinking in many cases.

The other thing that's really unique about our culture is that we bring folks equally from the biology and chemistry side and also from the data science, software engineering, automation engineering side. And that has forced us from the very beginning of the company to create a new language.

And that language has become the foundation of our technical culture at Recursion, our technical philosophy. And so now, when we bring people in, it often takes them six to 12 months to really get onboarded, because there is this complexity of a new language and a new way of thinking. But it's become deeply rooted in Recursion.

And I think, trying to create a shift like that, where data scientists are valued just like a biologist or chemist when it comes to making decisions about discovering a new medicine, is fundamentally almost impossible at a larger company. There's just decades and decades of inertia and momentum behind the way things are done. And so I think the companies that really reinvent this industry in the future are going to be the start-ups of today. I think you probably share that belief.

TS: That's fascinating. You decided to start the company in Salt Lake City. Why did you go there? And how do you get the talent that you need to come to the area to do this?

CG: Well, the reason why we started here is because it's where my wife grew up and where we decided to build our family. And so I was here, training with Dean Li, who has become essentially the Chief Scientific Office of Merck, the very, very large US biopharma company.

And I fundamentally believe that while you may not be able to start a company anywhere, you don't have to start a company just in the one or two hubs around the world. Especially through the pandemic, we've seen that talent is available globally. There are ways to connect with people all around the world. And even when you're building in any city at some scale, if you create an incredible culture and you create an incredible company, you can often recruit and retain people from all around the world to come join you. And that's exactly what we've done.

And I would say for those we need onsite at Recursion, some of the scientists and people working on our automation systems, and it's about 80% of the company

that's onsite here in Salt Lake, for that group, we do spend more time recruiting. It takes more work. Our Chief Operating Officer, Tina Larson, was in the Bay Area, and I had to fly down, I think six different times, to slowly, over months, work to get her and her family to make the decision to move out here.

But once people do, in most cases, what we find is that our retention levels are much higher, because people feel like they're part of a mission, and they're not walking down the street, being distracted by a dozen offers a year to go join other companies. They certainly, if they want to make a shift, can.

But we've created this resilient culture, this focused culture of people who feel like they're on an exploration, and they've said, I'm going to be on this ship through thick and thin, through the storms. And I think it's really benefited us. It certainly has some costs on the recruiting side, but it's really benefited us in many ways.

TS: And let's talk about those people. You've talked about working at the intersection of technology and biology. So what is the type of person that you need to recruit? Is it the Silicon Valley move fast and break things? How do you gel that with the more slow-moving, cautious approach that you maybe get in the biosciences?

CG: I think we really look for first principle thinkers. And what that means is that if we're working in a part of the field where we're not taking risk related to human patients, we want to move fast and break things. But it also means if we're doing an experiment in humans which has an extraordinarily high moral and ethical obligation and responsibility around it, that we have a team who is conservative and cautious when it makes sense.

And we're not looking for people who are de facto conservative or de facto aggressive and want to break everything. We're looking for people who know how to apply a first-principles approach to whatever the scientific problem in front of them is.

And so we get a lot of systems thinkers, industrialised mindset, very growth oriented individuals here at Recursion. That's what we try to attract. But many of them have decades of experience from the industry, and we think that's really important too, because there's a lot we can learn not only from the successes they had but the failures that they saw, the pain points that they witnessed.

And a lot of our team is not the traditional Silicon Valley, young male start-up culture. A lot of our team are experienced women and men with decades of experience in biopharma, but they want to come here because they believe there is a better way, and they are very adept at understanding when they can apply a mindset shift to various scientific and technical problems. And that's another great element of our culture.

TS: And you've been quite creative in the way that you've tried to recruit people. You talked about going down to the Bay Area six or seven times to finally convince your COO to join, but in other instances, you've had a very different approach, so running an AI competition released to the open-source community. Talk about the thinking behind those sort of initiatives.

CG: That's right, Tom. So me or others on our team getting on airplanes doesn't scale, so we can't do that for all recruiting. And so, yes, we've tried to be creative. And one of our favourite tools was that we released a huge data set back in, I believe this was 2019, the largest data set of its kind in the world.

And we partnered with Kaggle and Alphabet to create a competition on Kaggle. And we had over 860 teams that used this data set to build machine learning algorithms to interrogate biology. And then as soon as we saw the results, we went and tried to recruit directly the data scientists who'd been a part of that.

And what's I think exciting for us is that sometimes, it isn't just our ability to go find the talent, it's the talent's ability and belief that they can make a difference in biology. Because in many cases, these data scientists have not been trained in biology. Their last class in biology was maybe in high school. They don't know that they can contribute.

And what was fascinating about that competition is that we were able to create a framework for those scientists to understand this set of biological questions as more of a computational challenge. And I think that got a lot of them excited and it opened the door. I think we hired the first or second top-ranked individual, who is now one of our core data science team members at Recursion, and many others behind those.

But we're also creating, I think, excitement for a whole generation of these data scientists. Maybe they don't join Recursion for one reason or another, they join one of our competitors, but at least they're applying their efforts towards a problem as impactful as discovering and developing medicines as opposed to perhaps optimising some social media link or something. And there's nothing wrong with that, but for us, we think it's more impactful to be focused on biology and human suffering.

So we're seeing a huge shift. You've seen this probably in many companies. People of the new generation, Gen Z, really want to have an impact with their career. And so it's resonated for folks. And I'll share with you, I don't know when the podcast comes out, but there's the potential for us to release another largest-ever data set in the coming months. So I won't share the creative motivation behind that, but maybe more recruiting in the future.

TS: Excellent. Well, I'm sure there'll be people listening to this who will be interested to look out for that. Could I ask, just in your experience of building the company, what do you know now that you wished you'd known ten years ago?

CG: Oh, a lot of things. But I would say top of my list is hiring and managing people is much harder, I think, than the science. And I think I've spoken with you and others at Baillie Gifford around this question. I underappreciated, at the time, how much investment I would need to make as a founder and a CEO in people. And I valued people, but I didn't understand how much of a science and an art management is, and developing people is, and hiring people.

And so to me, that's been the biggest learning. I wish I would've just known to invest more time there in the first two or three years, because science has truth. There's a right answer. And people have many truths. There's different answers for different people, and you have to invest deeply in them if you want to be successful. No matter how good your AI is, how good your robotics are, every company today still needs incredible people at its foundation.

And I think that's the... It took me probably three or four years to wrap my head around that as concretely as I should have. And it's been a journey ever since, and one that I think probably will continue for the next 20 or 30 years as we build the company.

TS: If you go back to the starting point for Recursion and the initial vision that you had, how has that shifted or evolved to get to the present moment?

CG: So I would say the biggest shift has been around business strategy. And there's two fundamental pieces of that that have moved. The first is that when we began Recursion, we believed that many drugs existed that were sitting on the shelves of biopharma companies, where they had failed for some reason, but if you could find a new way to use them, a different disease perhaps, that that could be a solution.

And what we found, Tom, was that the reality was that there's a variety of perverse incentives, both in biopharma as an industry from a payer perspective, in the way our patent system works, that makes that approach generally hard to scale outside of a narrow set of diseases. And so one business reality for us is that we've had to build some of our own medicines, and now most of our pipeline are brand-new, built-from-scratch medicines. And that's required extra investment.

The second was that we believed that the biopharma industry would adopt all these new tools and technologies and mindsets as fast, if not faster, than we would at Recursion. And though there are many fantastic foci of that kind of thinking in the industry, and we're partnered with colleagues at Bayer and Roche Genentech, where we think some of this thinking is taking place, the reality is

the industry is not moving as fast to adopt these new tools, at least at the scale of a company like Recursion.

And that's meant that in some cases, we've had to take our own medicines into the clinic. And I've talked with you and members of your team about this. We had always wanted to avoid running our own clinical trials because it felt like a new front of innovation.

TS: Yes.

CG: And the reality was, if we wanted to wait for the industry to catch up with where we are from a technology philosophy perspective, we would have to pause the development of some of our medicines to wait for them to get there. And if we believe these medicines have the potential to benefit patients, I think we have a duty to advance them. And so that's meant that we've had to move into that new front of this battle of science to do our own clinical trials. Those are the two fundamental shifts. Tons of little, tiny shifts, but those are the two big ones that I would say.

TS: What would you say is the company's competitive advantage or edge that increases the chances of fundamentally changing drug discovery? I feel like it's come out across some of the answers you've given today, but pull it together for us.

CG: Sure. So I think there's three points here. The first is that we believe we've built the largest relatable data set in biology on earth. The second is our culture. We've created this team who is fluent in working at the intersection of many fields, many technologies, and I think that's very difficult to do. We're essentially training a new generation of Recursionaut. And I think that'll fundamentally set us apart and is underappreciated by many.

And the final is business strategy, which is, there are hundreds of companies in this space today, and the vast majority are focused on a point solution. They're identifying one step out of the hundreds of steps to discover and develop a medicine, and they're trying to solve that step. And it turns out that because there are so many steps, it's very hard to accrete significant value to any one step. What you really need to do is own an entire vertical or chunk/portion of the vertical of discovering and developing medicines.

And we're one of the very few companies, and I would say, in many thanks to supportive, visionary investors such as you and your team who believe that this is the future, we're able to actually try and integrate many technologies, with a core philosophy, but many technologies across many steps, and ultimately create medicines that are in the clinic, in human patients undergoing clinical trials today.

And that's highly differentiated. And this capital market friction we see around us is actually really separating the three or four companies who've been able to make that leap from the hundreds of companies who I think are at earlier stages, who I think are facing a really, really challenging next couple of years.

TS: That's interesting, because the partnership with Recursion is really important to us, but we haven't been able to contribute much beyond patience and just letting you and your colleagues do the amazing work that you're doing. But I guess one way that we have been able to contribute is with long-term capital from quite an early stage. And as you say, it does feel that's both a differentiator and probably an opportunity at this point, given the funding environment that smaller competitors, with potentially interesting technologies, are in.

CG: I think that's exactly right, and I think our world needs more visionary, long-term-thinking people, especially in the capital markets, because some of the biggest, hardest problems we all face as a society today, some of the problems that'll unlock the most value, are not problems that can be solved with a new algorithm overnight. They're problems that are going to take years of investment.

And so finding thought partners such as you, we had fantastic back and forth with members of your team around ideas around commercialisation, which I still think a lot about. So you all have been fantastic partners. I just wish that there were more investors with a similar philosophy to the one that you all have.

TS: And when you say members of my team, I would definitely acknowledge the contribution of Marina Record here, who has been really helpful to me in understanding the space and the area and what you're doing. Could I ask one final question, if I may? What does the world look like if Recursion succeeds in its mission?

CG: Yes, Tom, I think over the next decade or two, if Recursion is successful, there will be better medicines available for the people who need them, at lower prices. And I hope that that happens all across the world.

But I think even beyond that, Recursion has a mission that isn't just about pharmaceutical treatments. I think over the next 30 or 40 years, it can be more broadly applied to wellness, understanding our biology more generally and all of the things that fall into the realm of biology. So better medicines is a start, but over 30, 40, 50 years, I think it's about creating health and health span and creating less suffering, at scale.

TS: I think we can all wish you every success in that mission. So thank you so much for taking the time to join us today. It's been fascinating.

CG: Thank you, Tom. Really appreciate it.

CS: That was so interesting, just listening to Chris and yourself there. And I think the thing that probably struck me the most is we say on paper and we say to our shareholders that we support these visionary entrepreneurs who are imagining what the future might look like. Chris is definitely one of those.

TS: Yes, absolutely. As you have heard, he's been an outsider to that industry and come in with a completely different approach to the whole process of drug discovery, it's a fundamentally different model to trying to discover medicines, and then doggedly pursuing that vision through to the present day and overcoming all the significant challenges that go with it.

CS: One of my biggest takeaways was, when he talked about the pharma industry as we know it at the moment, there are few benefits of scale, if you like. Success with one drug tells you nothing about the success of the next drug. And when Chris was talking, he was talking more about it like a technology company, not a traditional pharma company.

TS: Yes, well, that's right. So when I go back to when I first heard about Recursion, it was an early-stage drug discovery company. And then I heard that it had one of the fastest supercomputers in the world. And it just said there's something actually quite different going on here.

And yes, it's been an approach that has been much more about understanding the developments, the technologies that we've seen in other areas, and applying them to a field that just hasn't seen anything like the same pace of change and experimentation and innovation. And so moving at that speed in an industry which is used to taking its time is really unique.

CS: Yes. And Chris alluded to this as well. He mentioned we've been one of the investors who have been there with their journey. And we first invested, when was it, 2019, I think. And it's safe to say you bought in to Chris's vision quite early on. So what was it about Chris that attracted you? What is it about Chris as an entrepreneur that excites you?

TS: Well, I think the first thing was that he had this approach that he believed in that wasn't a conventional one, and his pursuit of that, his vision is a diagnosis of the challenges that the industry faced that fitted very well with how we saw it. So I think there was a number of these things.

And then, coming back to what you were talking about before, it's this idea that you can have enduring advantages or enduring and compounding advantages, that you build the platform, you build the technology, and the drugs are just the output of that.

And it just turns on its head the whole model of the way the industry operates, which is, you have this drug in clinic, we'll look at how many patients there are, we'll put an odds of success and then come up with a numerical value of that

drug. And then you add those up for the drugs in the pipeline, and that's the value of the company.

But here, the value is not in the individual assets, it's in the approach, it's in the technology platform, it's in this ability to generate potential drug candidates and to generate lots of them. It's what value do you attach to that and what value do you attach to the fact that each iteration just makes the whole system better for subsequent discoveries.

CS: And I loved as well the fact, when you were talking about value, when you asked him what he thought Recursion's competitive advantage was, and obviously the technology is one side, but the culture is also hugely important. And that really came through for me, when he was talking about breaking down siloes of people that don't traditionally work together. He seems very open-minded in his approach to culture, which I thought was really interesting.

TS: Well, I think that it is the culture that drives all those small decisions. And it's really difficult to have something unique when it comes to a cultural approach. But I think the combination of doing something very different in an existing industry, that doing it in a geographic location that's different from everybody else, where it's a real commitment to join the company if you don't come from that area, you're less likely to rotate around a series of different drug companies, so I think the employees are much more connected to that mission.

And then there's the mission itself, which is about taking cost out of the system. And that isn't always the objective of players in the healthcare system, that this company is committed to improving efficiency and taking costs out for patients ultimately, which I think is again something that is very attractive to employees. It's a mission that they want to work on.

CS: In terms of Recursion, it's only a company that's, what, nine years old, and Chris alluded to it during the podcast, what they've been able to achieve in that time is incredible. And I think when he talked about the partnership with Roche's Genentech, for me, that's really external validation of their approach. Having a collaboration of this scale that they've been able to do is a real endorsement for the company.

TS: Yes, absolutely. And it comes from bringing something completely different. And if you take the neuroscience as an area, it has been extremely difficult to make progress in this area. The track record of bringing potential drug candidates through into effective medicines is dreadful, frankly...

CS: Yes.

TS: For the industry as a whole. And so it needs a new approach. And that's why a company as big and successful as Roche Genentech is prepared to work with somebody like Recursion, because it's novel, it's different.

CS: Yes.

TS: And I think you're absolutely right, I think that's a really powerful external validation of the platform. It will be part of the value creation going forward, but equally, there's a lot of value that the company can create on its own. If it can work with a low enough cost base to go after these smaller patient populations, it could offer hope to... They talk about this area of rare disease. Rare diseases are individually rare, but they're collectively very common.

CS: Yes.

TS: I think it's 7% or 8% prevalence in the global population of rare diseases. And in most cases, there is not effective treatment. So it is potentially transformational for patients if you can go after these smaller populations and do the science to actually develop effective medicines.

CS: Absolutely. And I think they can really play a central role in making treatments for these more affordable. What do you see, Tom, as the biggest challenge from here for Recursion?

TS: Well, I think that up to this point, they have made lots of progress in addressing the science, the inefficiencies in the science and the drug discovery, the earlier stages of research. And as the company matures, it's having to do more of the work in taking that science and turning it into medicines. And as it does that, it has to interact with lots of other large organisations. It has to interact with the regulators.

And so one of the challenges is, how do you keep the velocity up, the pace up, when you're having to work with other players that don't move at the same speed that you do? How do you acquire these different skill sets, whether it's in chemistry or whether it's in drug trials, and bring them into the organisation in a way that's...? We've talked about the strength of the culture. So how do you bring them in, in a way that doesn't affect that cultural approach, doesn't slow the company down, and still makes the basic science the absolute core of what they're doing?

CS: So maybe then, Tom, one last question for me. It seems that the opportunity for Recursion is so large. I think Chris said they don't feel limited in terms of what they can go after. It seems their approach can almost be applied to any disease. So is one of the challenges for Recursion then what do they pursue, and when? Is that going to be the big question for them?

TS: Yes, absolutely it is. They will only be successful if they focus their resources onto the biggest pay-offs. And often, when the opportunity set is so broad, it can be quite paralysing, as where do you go next? That's why some of these questions about culture are so important, because that's what informs those choices.

Culture is something really intangible, and you can't make definitive statements about it. But if you can just get a little way in trying to understand that as an investor, understanding how they will make those choices, how do you take that enormous universe and whittle it down to the opportunities that you're going to pursue, and understanding the mindset that drives that, is a really important part of trying to understand what the potential set of outcomes will be.

CS: Just leaves me to say a huge thank you to our guest today, Chris Gibson from Recursion Pharmaceuticals and of course Scottish Mortgage manager Tom Slater

In the next episode, we will be talking to Uma Valeti, Founder and CEO of Upside Foods - a company leading the way in the cultivated meat industry.

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