Exchanges at Goldman Sachs

Why We're in a 'Golden Age' of Life Sciences Innovation

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Allison Nathan: The business of life sciences came into sharp focus after the pandemic highlighted the effectiveness of mRNA vaccines in protecting people against COVID. But what exactly is life sciences? And is the recent market weakness a threat to future innovation or an opportunity?

Amit Sinha: A lot of people think of life sciences as a niche market, but it's the largest driver of health care innovation. It's about two-thirds of total health care venture capital and is over a $2 trillion market today. What we think is going to happen is, as we come out of this correction, we're just going to see a different landscape in terms of life sciences capital that in some ways is responsive to the capital formation issues that helped create the current situation.

Allison Nathan: I'm Allison Nathan and this is *Exchanges at Goldman Sachs*.

To help us understand the evolution of life sciences and the risks and opportunities within it, I'm sitting down with Amit Sinha, the head of life sciences investing within Goldman Sachs Asset Management. Amit, welcome to the program.

Amit Sinha: Great to be here. Thanks, Allison.

Allison Nathan: So let's start with a basic definition of the industry. What exactly is life sciences? And what sectors of the economy does it encompass?

Amit Sinha: So life sciences is a subset of the health care industry that sells products that are created from life sciences based innovation. So things like therapeutics, research tools, diagnostics. When you take the life sciences segment and you start to peel it apart, you'll see that therapeutics is the largest piece with about 90% of the pie. And within therapeutics, we generally talk about categories by either therapeutic areas like oncology or metabolic disease, or we'll talk about it based on

modalities, so how drugs work. So for instance, cell therapy or gene therapies or antibodies. And this collection of therapeutics is what most people refer to as the biotech industry or biotech. And that's really how do we use technological advances in the field of biology to create medicine.

Allison Nathan: So that's biotech. So what else is there in life sciences?

Amit Sinha: Even though therapeutics is the largest segment, tools and diagnostics are really important in their own right. And also they're important in the context of shaping the future of therapeutics innovation. So think about rapid antigens and PCR tests as an example that were developed for COVID. Those diagnostics have become a critical part of how we live our lives and manage broader public health.

Another example that's more technical is the field of single-cell genomics, which has the potential to really help our understanding of various diseases, cancer specifically or in particular. So to give you a sense of what that looks like, in cancer today, oftentimes what people will do or doctors

will do is they'll sequence your tumor to see if there's a genetic driver of disease that can be the basis for using a targeted therapy. The problem with that is they do a bulk sequencing, and we're finding out that tumors are heterogeneous in their composition. And so what single-cell genomics does is it looks at each cell independently. And by doing so, we can get a more accurate picture of what's happening, which can hopefully be used to better treat the patient.

So we believe all these areas are important sources of innovation and value creation, and we look at them broadly in the context of potential opportunities for investment.

Allison Nathan: And so what's the potential market size of some of these technologies in the overall space?

Amit Sinha: It's funny. A lot of people think of life sciences as a niche market, but it's the largest driver of health care innovation. It's about two-thirds of total health care venture capital and is over a $2 trillion market today. And analysts are predicting that some of the new platforms that are emerging like mRNA or cell therapy, they have the potential to grow the overall market to more than $5

trillion. And a lot of people we speak to talk about, “I'm really interested in health care because of all the growth.” And my first question is: Are you invested in life sciences? Because without that, you're really missing the majority of the innovation that's happening in the industry.

Allison Nathan: And the sector has certainly seen a surge in innovation that's made a real contribution to public health in the last couple of years. Of course, the mRNA vaccines being the glaring example of that. What are other key areas of innovation in life sciences?

Amit Sinha: You have to start with the core underlying disciplines where we've seen tremendous progress over the past 20 years or so. So areas like genetics, immunology, cell biology, and more recently artificial intelligence or machine learning, we think all these things are going to have a profound impact on the field. Then you have the intersection of those disciplines creating these amazing platforms for innovation, and these include things like gene therapy, gene editing, RNA interference, CAR-T, immunotherapy, or stem cell based regenerative medicine.

Allison Nathan: Obviously we've seen the real-life example

of what an impact the mRNA vaccines can have. What are some of the other real-life examples of some of the areas of innovation you just mentioned?

Amit Sinha: One of my favorite experiences during my almost two-decade career at Goldman was working with a company that was developing a gene therapy for a condition called spinal muscular atrophy, or SMA. This is a terrible, heartbreaking disease where children with Type I SMA lose the ability to use their muscles, and they typically die by age two. By providing functional copy of the SMN gene has allowed these babies that would have otherwise not have survived to live and thrive. It's just an amazing outcome.

Another example, there was a recent study done out of Memorial Sloan Kettering that was just published in June this year where a relatively modern approach to cancer called immunotherapy and specifically checkpoint therapy was used to treat rectal cancer patients and completely eradicated the cancer with some patients now being cancer-free up to two years. And they did this without the use of chemotherapy, radiation or surgery, all of which can have real complications for these patients. And so while it's

a small study and larger studies need to be done, when you see these sorts of outcomes, it's incredibly promising.

Allison Nathan: But when you think about this field of life sciences and biotech broadly, oftentimes we're hearing about ethical dilemmas. Anything with innovation in the space of health care can often bring those up. So how are companies and investors navigating ethical considerations as they look to innovate?

Amit Sinha: What's been impressive to me is the amount of thought and collaboration that's gone into navigating the ethical questions that have come up in some of these fields. So for instance, in the field of gene editing, most countries have adopted policies that restrict the editing of germ line cells, so egg and sperm that would allow genetic modifications to be passed down to future generations. But some of that was a fear of creating what some people call designer babies, but a lot of it was because the technology is so new and we don't know the long-term implications of editing an individual's genome. And we certainly don't know the implications of editing the genome of an egg or sperm that could ultimately be used to create an embryo down the road.

At the same time, some people are arguing, “Hey, if we could eradicate certain diseases like sickle cell anemia or SMA, like we just talked about, why wouldn't we do that?” And so there's an ongoing conversation about the risks, the benefits, and the ethics. And that's the important thing, which is that we need to be having an ongoing conversation that's informed by data and science but also involves a broader set of stakeholders who aren't just focused on science and medicine but are also focused on some of the potential societal implications of adopting these technologies.

When it comes to investing in the companies we look at, most of them are operating pretty far from the line with respect to these issues. They're more focused on how do I treat an individual patient who has a severe disease where nothing else works? And so while we need to having the conversation I just referenced, it's not necessarily one that's front and center when it comes to companies we invest in that are working on important medicines for tomorrow.

Allison Nathan: And do you see a difference geographically

in those types of considerations, different parts of the world looking at them differently? Obviously we have a very complicated geopolitical backdrop as well. Does that have implications for innovation in the sector?

Amit Sinha: It's something we're watching closely. What we see right now is perhaps more siloed innovation with questions being raised around some specific regulatory outcomes for non-US-based companies who have faced setbacks in getting their products approved here with the FDA. We're also seeing a trend towards re-nationalization of elements of the supply chain, particularly manufacturing as supply disruption in the life sciences industry has been an issue, just like it has been with so many other industries over the past couple of years.

If we move away from a more global-based innovation paradigm, which is where we've been moving over the past 10 years or so, where research, clinical trials, manufacturing in different regions can't be utilized, it's quite possible the rate of innovation will suffer over a longer period of time. And that'll be unfortunate not only for the field but ultimately for patients.

Allison Nathan: And obviously, these are all new technologies in a sense, but is technology itself playing a role in facilitating innovation?

Amit Sinha: We think technology and specifically the application of artificial intelligence and machine learning to life sciences is going to have a very significant effect on the rate of innovation. There are several different dynamics shaping this trend, but at the most simplistic level think about it as two key trends converging. The first is an explosion of data, as the cost of sequencing a genome has fallen just a few hundred dollars. And that allows us to build rich data sets with genetics, biomarker, clinical data across really large populations.

The other high content biological data types that we're able to add to those things like epigenomics and proteomics allows us to further deepen our understanding and the data that we're able to collect in the context of studying different diseases.

The second trend is the massive increase in the computational power which allows us to make sense of all of this data in a way that humans never could. And

ultimately this enables us to train computers to actually predict things based on analyzing these very large and complex data sets. And these algorithms can be used for these analyses, and they can iterate and so you get better and better as the amount of data increases and is fed back into the system.

And, you know, what all of this boils up to is you can take a system today that has been almost entirely manual and experimental, and you can begin to automate and make it more predictive. And in doing so, the implications for the industry and for innovation are profound because we can take this system that's historically been slow and expensive with high rates of failure and start to make it run better, faster and cheaper, the same way that technology has done to every other industry that's been able to adopt it effectively.

Allison Nathan: And so is technology effectively allowing companies to bring new drugs to market quicker? What's the end result here?

Amit Sinha: A good recent example that we're all familiar with is Paxlovid. If you think about how Paxlovid has

developed, it's a great example of how artificial intelligence and machine learning can really accelerate drug discovery and development. Scientists have long known that targeting the protease enzyme in viruses can really result in strong antiviral activity. And the question with COVID was could you find a drug that could do it in a highly efficacious way but also be safe and tolerable? Now, the old way of doing this would have been to screen millions of compounds and test a large number of them in the lab to see which ones would have worked, and that process would have taken years.

Instead, what Pfizer did is they used computer-based modeling to arrive at a narrow set of compounds and then used supercomputing to figure out which ones could be formulated into a pill, which would be important for broad-based usage. And so this drug, which normally would have taken years, Pfizer was able to bring it to market and develop it in just four months. And so you think about that comparison and that contrast of four months versus years, it really tells you how life sciences innovation is going to be accelerated by layering on things like artificial intelligence and machine learning.

Allison Nathan: But Amit, as I'm listening to you, I'm thinking, wow, this is a sector that's really going to be so transformative in terms of public health and our way of life. But it is a sector that has gone through one of its most significant corrections in the past decade. We can point to some obvious reasons for that. We've seen a broad correction in high-growth, long-duration companies. But what are some of the sector-specific concerns weighing on the industry right now?

Amit Sinha: Allison, I'm glad you raised that because it's worth picking apart the current life sciences market correction a little bit. So, first, depending on what index you look at, we're off roughly 50% from the highs of 2021, and you're right, that's the biggest correction we've seen since the financial crisis. We see a few different reasons, from fundamental to financial to macro, that are all impacting the space and driving the correction.

On the fundamental side, we've seen a bunch of disappointing news over the past year. These have been things like clinical trial failures to FDA setbacks, and they've served as an important reminder that life sciences innovation is risky. Now, during this last cycle, we also

saw -- and this is important -- in that we saw a dramatic shift in the typical stage of companies that were going public. So, for instance, if you look back at 2014, which was our last cycle, 90% or more of the companies that were going public were well into the clinical stages of testing. Whereas in this last cycle, that was right around 40%, and most of the companies that were going public were either pre-clinical or just entering the clinic.

And so if you think about that simplistically, because most of the companies were going public earlier and the probability of success in earlier studies is much lower, you should see that a large number of the outcomes are negative. And that's what we're seeing in the space today.

Now, if you move on to the financial and capital side of it, you'll see the other thing that happened during this cycle is the amount of venture capital raised in life sciences went from $5 billion to over $20 billion. And when you see the total amount of capital going into a space rise that far, that fast, you inevitably see things that get funded that probably shouldn't be funded. I can tell you, as we're out looking for things in the private market, we are finding our selection rate to be less than 5%.

The last part of it is, when we have an explosion of platforms the way that we have, which has been phenomenal for the field, we've in some ways harvested the lower-hanging fruit, and so the path forward is just going to be harder. And we don't know what that really means from a timing or risk perspective. So I'll give you an example. If you take the field of CAR-T, which is a form of cell therapy used in cancer where we take T-cells and we genetically engineer them to attack cancer cells, we've seen some amazing outcomes in hematological malignancies like B-cell lymphomas. But when we've tried to use the same approach in solid tumors, we've run into a bunch of technical challenges because we're learning that solid tumors just behave differently, and they have a lot of additional complexity. And so while I'm optimistic that ultimately we'll figure this out, I think what we're seeing is the road may be a little longer and steeper than initially suspected in some areas.

And then on the form of capital, we are seeing some forms of capital leaving, there's no doubt. But we're also seeing some new entrants, ourselves included. What we think is going to happen, as we come out of this correction, we're

just going to see a different landscape in terms of life sciences capital that in some ways is responsive to the capital formation issues that helped create the current situation. So for instance, we are seeing more investment firms interested in the idea of keeping companies private for a longer period of time so they can be scaled in a way that the public markets may not currently support. And while that might be the right answer for some companies and going public might be the right answer for others, I think what's really important for the field is that we get to a place where we have a broad range of funding alternatives for companies so they can scale in a manner that helps them best realize their potential.

Allison Nathan: So even though the environment has gotten more difficult, you don't see big problems with these types of companies funding themselves at this point?

Amit Sinha: We think in the near term there is going to be some challenges, particularly for companies who have recently gone public, just given the correction. But what we are seeing is firms are able, on the capital side, are able to continue to raise capital and new funds are being created. And what we think is there's just going to be

different forms of capital available. And so you're going to see a shift, but the best companies are going to continue to be able to get funded and grow. And a little bit of the correction we're seeing is frankly good and healthy for the space because it drives more rational allocation of capital.

Allison Nathan: And you said yourself that this is a high-reward but it's also a high-risk sector, and so how do you think about assessing these risks versus the returns where the probabilities of seeing big breakthroughs is very low, especially obviously the earlier you invest but in general many negative outcomes?

Amit Sinha: So to try to manage the risk that's inherent in the space, we really look at both criteria of the investments that we make and then we focus on taking an approach that we also think will mitigate risk. So on the criteria side, the first thing that we do is we start downstream traditional venture, and so we're not doing things like company formation. We're not doing open-ended science. We're really trying to focus on investments where there's a formed management team, the programs are starting to be translated into things that look and feel like medicines and there's real data around them that can be looked at and

evaluated in the context of investment.

The second thing is we avoid single-asset binary bets. And so everything we look at has multiple programs or they're based on some of the platforms we've talked about. And we think that they're scalable, and that's another way that we mitigate risk.

And then some of the themes that we're focused on like precision medicine, they're just less risky because you're going after specific drivers of disease, and you're building kind of molecules that are custom built for that driver of disease. And they're focused on very specific patient populations. And so that general approach is just less risky than a one-size-fits-all or something that's not rooted in a specific driver.

On the approach side, we start with sourcing, and one of the things that we can do is leverage our broad network as GS and we can leverage our incumbent businesses like banking and research and the networks that come with that. And we can use that to make sure we're sourcing from the highest-quality academic institutions, venture firms, corporate entities. And then we do a lot of work on

these companies. And to give you an example, our typical investment, we spend months working through them and we talk to technical experts like medicinal chemists or structural biologists or field experts like oncologists and neurologists, anyone that we think is relevant to looking at a particular innovation that we're contemplating.

And then I think the last part of it is it's not just about the scientific underpinnings. We also will look at going back to the financial and the macro relays. We will go back to and talk to some of our banking colleague about the IPO markets or the M&A markets. We might talk to our macroeconomics team about what's happening with the macro economy and the outlook. Or maybe even our office of government affairs, if we think there's an important policy overlay.

Allison Nathan: And regulation has come up in our conversation, but it's just such a huge determinant of outcomes in the sector. So how does it factor into all of this? Where do you see the regulatory situation evolving?

Amit Sinha: As much as we talk about some of the setbacks on the regulatory front and the surprises that

have been weighing on the sector in the context of this correction, our general view is that the regulatory environment looks favorable. We've gotten over the past 10 or 20 years just a bunch of tools from the FDA, things like breakthrough therapy, fast-track designation. These have all helped to really accelerate the review and approval of medicines.

You know, if you think about COVID through the use of EUAs, or emergency use authorizations, we saw a massive increase in the speed of the timelines for these vaccines and antibodies and oral antivirals. Things that would have taken 5-9 years were taking 5-9 months from the start of clinical testing to being in the hands of patients, so that's amazing. Now, we don't think that 5-9 months is the new normal, but what the pandemic has done, in some ways, is it's shown us what's possible if we need to really move fast. And patient advocacy groups, other stakeholders, they've all been paying close attention. And so now that we've seen what's possible, the question is how are we going to move forward? And I think we're going to see a lot more focus on the regulatory process because we've all been trained to look at it more closely as a public.

Just think about how closely we're all following when the vaccines would be available at different cohorts. Even now, we're following when, you know, the Omicron vaccines are going to come available this fall. We're just trained to pay attention to this stuff in a way that just we weren't a couple years ago.

So when we think about the “Why now?” in terms of what we're calling a golden era for life sciences innovation, we think it's a combination of things that starts with the groundbreaking science, and we've talked about that. It's enabled by the formation of these deep capital pools, and we're moving through some of that but we think the future looks really bright in terms of the capital pools. There's no question it's a broader and deeper set of capital than certainly had five years, ten years, twenty years ago.

I think the final piece of it is that regulatory backdrop that you mentioned, which we think is also going to be a tailwind. So when you put all of that together, we think it's a really compelling backdrop for innovation in the space.

Allison Nathan: Such a fascinating sector and with such important implications for our quality of life in our society.

So thanks very much for joining us and sharing your insights on it.

Amit Sinha: Thanks so much for having me.

Allison Nathan: Thanks for joining us this Wednesday, July 20th, 2022, for another episode of *Exchanges at Goldman Sachs*. If you enjoyed this show, we hope you follow on your platform of choice and tune in next week for another episode. Make sure to share and leave a comment on Apple Podcasts, Spotify, Stitcher, Google, or wherever you listen to your podcasts.

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