Stanford eCorner

Making a Difference in Biotech [Entire Talk]

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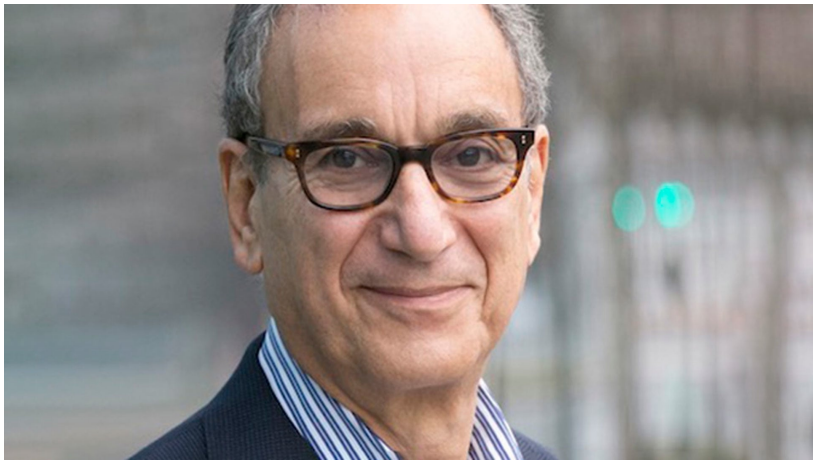
As the president and CEO of Vir Biotechnology, as well as in his role as head of BIO's Coronavirus Collaboration Initiative, George Scangos has emerged as a global leader in the fight against COVID-19. In this conversation with Stanford structural biology professor Jody Puglisi, Dr. Scangos explains the challenge of building financially viable therapies for infectious diseases, talks about the current status of COVID-related research, and explores how to build an innovative and meaningful career in biotech.



Transcript

Woman Who you are defines how you're built.. 00:00:07,710 Man On this episode, we're joined by George Scangos.. 00:00:10,400 George is the former CEO of Biogen and the current president and CEO of Vir Biotechnology, a company that is developing new therapies to fight some of the world's most dangerous infectious diseases, including COVID-19.. He's host and Stanford structural biology professor, Jody Puglisi.. Jody The thing that touched me most about George is 00:00:31,920 he was a professor at Johns Hopkins, starting out as a professor when I was a student there.. Our paths never crossed 'cause I was .... Didn't wanna get my hands wet with biology.. I was too busy doing chemistry and physics at the time.. But that leads me to the question of his own life's trajectory and the exceptionally courageous move that he made in the 1980s to move from a cushy academic job into what was then the nascent field of biotechnology.. And so I really just wanted to start off by asking George to maybe tell a little bit about his trajectory and, you know, what pushed him to make this jump from academia to biotechnology..

And when you started off getting a PhD, I'm sure you had some vision of what it is you wanted to do.. And, you know, now sitting where you are now, you know, has that path diverged or met what you dreamed of years ago? - Okay, well, first of all, lemme say thank you to you, 00:01:38,330 Robbie and to Jody for the invitation.. I'm really happy to be here today, and this should be fun and interactive.. And so I encourage people to ask questions.. Look, I graduated from Cornell.. I was a bio major.. I worked for a couple years for a company that manufacture laboratory supplies from microbiology labs.. And I realized after a couple of years that I didn't really care if the labs bought our supplies or the supplies from our competitors.. They all worked fine.. And so it really made no difference..

So that my efforts were firm, but they were pointless, right? What was the point? But I'd also learned that I loved what was going on inside the labs, and that the microbiology labs at Harvard, that was in Boston or some of the large universities there were really doing fascinating things.. And so I decided to go back to graduate school without much thought to what I would do after graduate school.. And so I went through.. I became kind of the default career path to stay in academia.. So I went on and did a postdoc at Yale.. And then after that joined the faculty at Hopkins.. A few years later, my postdoc advisor, his name is Frank Ruddle, came down to give a seminar at Hopkins.. I had invited him down.. He came to give a seminar.. And at that time I learned he had ....

He was stepping down as department chair and he was starting a biotech company.. And so I became an advisor to that little biotech company.. And so once a week, I'd get on there.. Once a month, I'd get on the train from Baltimore and travel up to New Haven.. I had to spend a day at the company and working on things.. And in the .... At that time, when I was a postdoc in Frank's lab, we had made the first transgenic mouse.. And so there are only a few labs in the world at that time that could make transgenic mice.. Now it's everybody can do it, but it was new.. And so they asked me and I agreed to take a sabbatical year, take a leave, go to the company, set up of the facilities so that we could custom make disease models that would more closely mimic human disease..

And we did that, I did that.. And I was quite taken by the work there.. The quality of the science was great.. It was way more collaborative than it was in my academic experience.. I think that's changed over time but .... And I was really taken mostly by the idea of spending my time doing research for the real purpose of bringing forward drugs that would improve the lives of patients rather than kind of giving lip service to doing that at the end of an NIH grants.. Right? So-- - Which I'm still

doing.. 00:04:36,501 (laughs) - Yeah, so I stayed, I took a year to close down my lab 00:04:42,915 and, you know, so .... But then I stayed.. That little company was bought by Bayer, big pharmaceutical company..

And I ended up working a decade for Bayer.. I never ever would have gone directly from Hopkins into a large pharma company.. That was kind of anathema to me.. But kind of my attitudes got laundered through the small biotech company.. I spent a decade working for Bayer.. I was, you know, a head of R&D.. I headed up their big .... They made a separate business out of protein drugs, recombinant drugs that were also new.. So I headed that business for a while.. And then in about 10 years later, I became disenchanted or wasn't one day when you become disenchanted..

But over time, I became frustrated with the over reliance on process and how process sometimes trumps.. - Sounds like an entrepreneurial moment.. 00:05:51,580 - And so I thought this was ridiculous, 00:05:52,600 and I didn't have a .... There was an aha moment when I was at some offsite team building thing.. And I just thought this was the most boring, ridiculous exercise I'd ever been part of.. And I looked around and everybody else was into it and they liked it.. So I said, "Okay, this is not the right place for me." And I went to the little start up.. You know, Exelixis at the time.. It was 20 people, was newly started.. I wasn't a founder, but I was there soon after..

Stayed there for 14 years as CEO and took it public, you know.. A couple of drugs now in the market.. So it's a success for a company.. And then I went from there to Biogen Large.. Biotech company on many billions of revenue now.. And that was a really interesting experience.. And then .... But that was in Boston.. My wife's on the faculty at UCF.. So that was a transcontinental relationship we had..

And so, you know, every weekend, one of us would get on a plane.. But that gets old after a few years.. And so I came back to the Bay Area and we started Vir, and here I am.. - Which we'll talk about more and more in depth 00:07:10,060 as we go through the interview.. But, you know, during your voyage from academia to industry, were there any individuals in the world of biotech that, you know, were role models for you? And, you know, one of the things that certainly is a hallmark of your career are these leadership roles that you took up and, you know, are there certain models of leadership that you learned from these people or from your own experience? - Yeah, there are several people along the way.. 00:07:44,310 (mumbles) you think about who had an influence on me, my postdoc advisor, Frank Ruddle.. You know, really great human geneticists, a great biologists, great human being, lovely families, wives also, professor at Yale, two lovely daughters.. So I learned from Frank a lot about science, but a lot about how to have a career that was quite consuming and still have a family and a normal life.. There was a guy named Stelios Papadopoulos.. So Stelios was a banker for a number of banks that were instrumental in funding the biotech industry in its early days and was instrumental in doing some of the most creative financing that we're done..

Today they're illegal, but they were legal at the time.. And helped to get the industry off the ground.. And I met him-- - Which wasn't entirely clear that 00:08:48,710 this was gonna be a money making operation.. There was a lot of business risk around biotechnology.. - Not at all.. It was speculative.. 00:08:57,640 A lot of people thought it was crazy, that the whole idea was kind of preposterous and you could never replicate and making bacteria or some artificial system proteins that humans made that would be different.. But, you know, he was a visionary.. You know, and making that transition from academia to industry, you don't know what industry is like.. You know? And you know it only superficially and you're in a good situation..

Or at least I was in a good situation.. So, you know, doing well and no reason to leave other.. And so making that transition and jumping into the unknown, something new and speculative was not an easy one.. - Not at all.. 00:09:53,023 And still the norm, that was a courageous jump at the time.. - Well, yeah.. I know my colleagues at Hopkins 00:10:01,103 thought I was either crazy or (mumbles) or both.. - If we fast forward to now, you know, 00:10:09,340 now the biotech industry is a mature, you know, multi-billion trillion-dollar industry perhaps.. - Yeah.. 00:10:16,700 - You know, what's changed in your view, 00:10:20,610 and, you know, what are some of the remaining challenges? - Well, science has changed a lot..

00:10:28,260 I mean, you know, even like, you know, conceptually what we were doing at Exelixis in the late 90's, early 2000s, is conceptually the same as a lot of the work we're doing in Vir now, except back then we had to do these genetic analyses in fruit flies and sea elegans and worms.. And it would take six months to do an experiment.. Today you can do them directly in a mammalian system with CRISPR and get more and more and more relevant information in three weeks.. And so the .... And that's the combination of advances, you know, in biology and, you know, CRISPR (mumbles) the Nobel Prize in (mumbles) and in data sciences.. Because you generate reams of data and you have to be able to make sense of it and parse through it and there's too much to do in your head.. So those two things have changed.. There've been successes.. You know, in the early days it was easy things.. It was insulin and just fructose that you normally made and that not could be made in (mumbles) they were easy..

And as the understanding biology has gone on, things have gotten more sophisticated.. You can do more challenging things.. And there have been successes.. So that means money has poured in, you know, They say you have access to the level of resources now that was unheard of a decade ago.. - Let's talk about the science 00:12:01,770 and perhaps some of the business challenges around what you're doing right now.. Which I think the audience will enjoy hearing about.. So immensely topical, which is your company Vir.. You know, what are some of the challenges you face there and maybe give an overview of what the company is doing right now and why it's so exciting? - Well, I'll tell you how we thought about Vir 00:12:22,500 at

the beginning.. They were focused on infectious diseases, and, you know, to start a company focused on infectious diseases is certainly counter to the prevailing views of the industry.. Much of the pharma industry has either reduced their efforts in infectious disease or gotten out completely just shuttered it..

The matter was you can't make money in infectious diseases.. And really that's because of antibiotics.. And, you know, you've probably read we desperately need new antibiotics to treat resistant bacteria.. The reason we need them so much and nobody's working on them is you really can't make money.. That if you succeed and make a new antibiotic, it is reserved for last line use because physicians are appropriately concerned that overusing it will result in the development of resistance to that one too.. So they want to save it for when it's truly needed.. And so it's a low volume product, and because of the way the antibiotics are prescribed and treated, the price is capped.. So it's a low priced product, and it's an acute product.. You take it for a few days or couple of weeks, and then you're done.. And the next time you use get sick, there's no brand loyalty..

You don't come back to that one.. You take whatever you get prescribed for your next one.. And so all of those things combined to make antibiotics a terrible business model.. And there were biotech companies that made very good antibiotics that went bankrupt, right? Even though they had approved drugs.. And so on the other hand, Gilead, you know, in the Bay Area, you know, has tens of billions of dollars of revenue treating viral diseases.. Treating, you know, HIV, hepatitis C.. Hepatitis C is also acute.. You know, you take their drug for a short period of time, you're cured of hepatitis C.. The irrational part is the healthcare system is willing to pay $30,000 to rid you have hepatitis C, but they're not willing to pay $4,000 to rid you of a antibiotic resistant bacteria that will kill you.. So it's not rational, but it's the way the healthcare system is..

But because so many of the companies had backed out, we saw a need, huge infectious disease problems.. You know, antibiotic resistant bacteria, what? Flu, you know, tens of thousand people die from flu every year.. Hepatitis B, which, you know, infects to almost 300 million people around the world.. TB infects a couple billion people around the world.. So the huge public health need and for the right indications also a tremendous amount of money to be made if we were to be successful.. So we went all in on infectious diseases.. Our goal was to be the biotech company focused on infectious diseases, and so to be able to compete head to head with whatever large companies were still in the running.. We raised a lot of money.. We raised almost $600 million, initially.. And you know-- - That is unusual..

00:15:58,620 I think, you know, maybe the audience has an appreciation, and that's an enormous war chest.. - That is.. It's an order of magnitude more 00:16:06,057 than most startups get.. You know, most startups these days, a little more, maybe it's 100 million, but it was 50 or 60 million.. There's still a lot of money, right? The idea was to go make some acquisitions, sign some deals, hire in a really good competent group of people and become go-forward really aggressively roll up other assets in the biotech industry that were underfunded, under exploited and become the leading biotech company in infectious diseases.. So it was pretty aggressive plan and we're on our way.. We had really interesting program.. We have really interesting programs in flu and hepatitis B.. We have, you know, a program with the Gates Foundation to make a vaccine for HIV and TB.. And so we're doing interesting things..

And then COVID came, right? So we had some assets and some ways to approach COVID and, you know, I remember it was January 5th when our chief scientific officer, a guy named (mumbles) came to me and said, "This is the big one.. This is gonna be a huge impact, and we should work on this." And so we started really early and pretty aggressively.. And for a company like ours, you know, we made some big bets 'cause we're not a huge company.. We didn't wanna stop the other programs.. We had to add this to them, which means we had to staff up, hire more people, spend more money.. We're bringing forward antibodies, which now, fortunately they look like they're going to work, but we had to make hundreds of millions of dollars of commitments for manufacturing contracts in the future.. And those are taker pay, right? So you pay for them whether or not your product succeeds and you need them or not.. And so that's a huge almost existential gamble for a company like ours.. I mean, I know we wouldn't have made it if we thought it was truly existential, but it was closed.. And so, you know, now we've been focused on COVID as well as those other two..

And obviously COVID is getting all the attention these days.. - Maybe you can comment a little more broadly 00:18:29,030 for the audience about the spectrum of therapies and approaches that are being taken by the industry to COVID and-- - Sure.. 00:18:36,210 - What the outlook looks like.. 00:18:38,820 - Yeah.. I'll start with vaccines.. 00:18:43,493 And, you know, they seem to get most of the news these days.. A lot of different approaches.. Moderna and then Pfizer together with a company called Bio and Tech, a German company, on developing RNA-based vaccines, probably near and dear to your heart.. - Yes.. (mumbles) 00:18:59,623 - That's a new technology, 00:19:04,283 has not been tried on the large scale basis before..

You know, the early data I would say are kind of encouraging, but not certainly not conclusive.. And we'll see.. You know, they're .... Each enrolling for vaccine trials, you've got enrolled tens of thousands of patients.. So their targets are 30 or 40,000 patients.. And we'll see how well they work.. J&J and AstraZeneca, AstraZeneca working with Oxford University, are developing vaccines based on adenovirus.. It's a human virus.. They have different strains of adenovirus.. I find my view is J&J has the more promising of the two, but that's just (mumbles) bias more than based on any hard data..

And then there are companies, GSK and Sanofi are two really good vaccine companies working together on a more traditional vaccine (mumbles) protein with an adjuvant ongoing.. So those are going.. The early data, I would say are somewhat encouraging.. They do generate antibody responses, whether it's enough antibodies, the right kind of antibodies..

Don't know how long the antibody response lasts.. We don't know whether it works in all age groups, all portions of the population, we don't know.. And people tend to think of vaccines like a panacea.. You'd get it and it's like, you know, smallpox when you're a kid or something.. If you get it, you're immune.. Well, that's one extreme..

The other example that's not even extreme might be FluTE.. Where, you know, you get and on average, the vaccine reduces transmission of FluTE by about 40% and less than that in the elderly and the people who need it most.. So we'll see where the vaccines go.. Hopefully for all of our sakes, I hope they work really well.. I think it's unlikely they'll work sufficiently well in all segments of the population and we'll need other approaches.. So Lily and Regeneron and we and AstraZeneca are bringing forward antibodies.. Lily published actually really interesting data this morning to say their antibodies work and their antibodies .... Again, very small numbers still.. But in their placebo group, I think it was 2.9% of patients.. These are patients early in their COVID core so they're not hospitalized..

2.9% were hospitalized in the placebo group and the treated group 0.9%.. So (mumbles) call it from three to one, a two thirds reduction.. A huge (mumbles) bars around that number 'cause the numbers are so small, but still pretty compelling that the antibodies are providing a benefit for those patients.. You know, Regeneron has some data, we have some data, and over the course of the next few months, you know, everybody will have enough data to know to what extent the antibodies are working.. But I think the early signs are that they're gonna be (mumbles) - It's happening at a remarkably fast timescale.. 00:22:36,210 And, you know, you have a role as CEO of a company, but you're also in a leadership role for the biotech industry at large through an organization called Bio.. Can you maybe comment a little bit, you know, how you wear those multiple hats and (mumbles) - Sure.. Well, look my primary responsibility is Vir.. 00:22:57,620 That's my day job, and I have to make sure that our programs are going forward rapidly, and we don't miss any beats here.. So far, so good..

We're on our way.. You know, we went .... Just to give you an example, we started this.. I started on January 5th saying we should find an antibody that is effective.. And that entered clinical trials in August.. So, you know, we found it, we had it manufactured, we've got the regulatory approval, everything in seven months.. That's a two to three year process in normal times.. So incredibly accelerated.. Lily and Regeneron did the same.. We signed a (mumbles) We're working together with GSK on this..

We have a collaboration with them.. That collaboration around COVID from the initial phone call I had with Hal Barron is head of R&D at GSK, (phone rings) until we had a signed agreement was three weeks.. That never happens.. So all my years, I've never had an agreement signed in three weeks.. You know, three months is fast and so-- - COVID has brought (mumbles) 00:24:13,920 - So COVID has changed the rules, right? 00:24:15,910 Because it is a pandemic.. There's a huge .... People are dying every day, right? - And maybe this is a good place to ask a broader question 00:24:25,000 'cause many of our audiences are engineers.. And, you know, the drug development is a .... Biotechnology is a very different type of activity.. Maybe some of your thoughts about the differences in biotech versus kind of traditional tech companies and maybe some of the opportunities for the smart young kids to go out and change the world..

- Yeah.. Look, I think biotech is so exciting 00:24:54,130 because it's a mixture of these days of science, of medicine, of data sciences, biophysics, and you need to bring all that together and they all play in each other and they all compliment each other.. We have amazing data sciences group.. You know, they're actually based in San Diego.. Incredible insight that we get and they get, you know, MIT runs these structural biology competition.. So they give you a learning set of compounds to say, "Here is (mumbles) these compounds on this targets." And then they give you another set of compounds to say, "Now you learn from these and tell us which of these others are gonna have the most effect," and then they run competitions to see who can do that.. So we've entered two, we won one, and we were second in the other.. - That's pretty good.. 00:25:53,173 - So we're doing okay, but it's amazing, the insights.. 00:25:57,420 You know, we think now we have gene expression patterns that can predict which patients will have bad outcomes to COVID or flu just based on the expression of lymphoid cells..

Yeah.. - I mean, this is remarkable steps forward, 00:26:16,140 the technologies that are available.. - So the data sciences are incredible.. 00:26:24,980 You know, and the biology is (mumbles) in the genetics.. - And you know, you're talking about it already, 00:26:31,130 but, you know, within the companies that you've led in a creating that cauldron of creativity and innovation, which is so essential to any entrepreneurial exercise now, what kind of approaches have you taken to ensure that? I mean, it seems the essential ingredient.. - So, look I think you need the right people.. 00:26:53,970 I think the success of companies like ours is really dependent on the people.. You need people who have a little bit of an iconic classic attitude, who are let's say arrogant enough to think they can succeed where everybody else has failed, but humble enough to know that that probably won't happen.. That's how you have these kinds of conflicting characteristics you need in the people and the organization.. Right? And so the selection of the right people is absolutely critical..

And, you know, a lot of people who are comfortable in larger companies are just not the right people, even if they have all the right expertise that you need.. - Absolutely.. 00:27:36,320 - So you need that.. 00:27:38,970 You need a sense of .... To instill a sense of urgency and you have to motivate people, right? Like people don't come to work every day thinking, "Geez, I'm excited to go to work because if we do a good job, we'll make a lot of our money for investors who are already wealthy." Right? That is not something that gets me out of bed in the morning.. You need .... The motivation has to be, "I'm excited to go to work because if we succeed, we're gonna improve the lives of a lot of people." And I think personally, because we have the ability to do that, we have the responsibility to do that.. And so, so many people are suffering, and so, you know, I've had

discussions with the boards along the years, you know, because there are certain people who believe that the function of a CEO is only to increase the value of the stock and do well by shareholders.. I personally don't want to be part of a company that does that and has that as their mode of operating.. I think that's actually irresponsible..

And of course, you have shareholders, of course, you have responsibilities to them and you have to generate a return.. And if you don't do that, you won't be CEO forever.. So it's not that you can't do that, but you can't do that as your sole focus.. We have responsibilities to patients, we have responsibilities to our employees, we have responsibilities to the community, to the enVironment.. I mean, we have to operate in socially responsible ways.. And so the nice thing to me about the biotech industry is that its focus is on improving the world, on improving the lives of people who are suffering in one way or the other.. And so if we succeed, then we have accomplished an important social good.. At the same time if we do it thoughtfully, we can return a substantial return to ourselves and our investors.. So I think it's .... You know, you asked me at the beginning what I thought about my career, I never thought about this, but I can't envision having ended up in a better place..

- It's a remarkable story and a remarkable voyage.. 00:30:03,470 And I think, you know, certainly resonates with me and even more so I'm sure resonates with the students in the class that are part of the generation that I think really do wanna make a difference and change the world and you know, are looking for avenues to do that.. And, you know, you're a shining example of that.. And, you know, we're all rooting for your success.. - Thank you.. 00:30:27,947 - Not just financially, but in terms of your clinical trials 00:30:30,660 and the success against not just coronaVirus, but the next waves of infectious diseases that are sure to hit us.. - I'll ask one last question, which is, you know, 00:30:43,870 what does the future of biotech hold? You know, where do you see the field going over the next 20 years? And no one's gonna hold you to your predictions.. (laughs) - Look, it's incredible.. 00:30:57,840 You know, if you think about the progress that we've made over the last 20 years, and you extrapolate that forward, it's just incredible.. But I think extrapolating it forward isn't sufficient because the pace at which we're advancing is accelerating..

So you have to take the second derivative action, you know, to think, and that's really hard to imagine, but I think we'll be able to .... Already starting to be able to manipulate genes.. We understand the genetic basis of disease to intervene.. We'll find ways to intervene safely.. I mean, nobody intervenes now in like changing genome.. (mumbles) genome with CRISPR or you can do (mumbles) There's still some safety concerns.. Those are not adequately addressed yet.. And then of course there were a lot of ethical concerns that people have as well.. Jody Sure.. 00:31:54,600 - Well, overtime, we'll figure out how to do that safely 00:31:59,560 and change a gene that gives you a predisposition to atherosclerosis or Alzheimer's or whatever to avoid those, minimize those..

And so I think the combination of genetics, and you know, you can't figure all this out just by laboratory experiments.. All of it has to be guided computationally.. It's just amazing, you know, understanding brain circuits, being able to intervene in, you know, psychiatric issues, depression, or-- - Yeah, I think neurological diseases are huge, huge, 00:32:38,880 you know, (mumbles) area of opportunity and also the aging population in the world in all areas that will need focus.. - And if you think about it now, you know, 00:32:53,550 pretty confident we can tell you if you were to like .... You know, we can take a blood sample today and tell you if you get COVID you are or you are not gonna have a bad outcome.. You know, if that were a simple diagnostic test that could be run by hospital, I'd rather than a really complicated test, that would be huge.. Right? Then you could do your clinical trials only in those people gonna have bad outcomes.. So you would save money because you're not treating a lot of people who don't need your treatment.. I think it's highly ethical to do that 'cause, you know, every drug has side effects and if people aren't gonna benefit or they don't need it, then you expose them to the side effects anyway, and that's not really an ethical thing to do.. - Just for the audience, 00:33:38,163 that's a term called pharmacogenomics, trying to understand how your genetic makeup affects your response to drugs, which is of course, a super exciting area of research and one that involves lots of computation, and lots of measurements and lots of analysis..

The opportunities are immense.. - So I think all that's going to change.. 00:33:59,900 So, you know, the one thing that could get in the way, not the one thing, but, you know, we have to keep funding the industry well.. It has to keep providing return to investors so they, you know, keep funding it.. You know, I don't think this is a discussion on drug prices, but there are certain solutions to drug prices that would crush that.. I think there are other solutions that wouldn't, so it's not an insoluble problem, but some of the knee jerk reactions I think would just crush it.. So, you know, as long as we have the right social environment, I think, you know, the students who are now in school can expect to have longer, healthier lives than we have, and we already have longer healthier lives and my parents had so.. - Yep.. It's been remarkable.. 00:34:55,930 George, thank you so much..

Maybe we'll open this up to some questions in the Q&A.. So the first question is, you know, how valuable has your technical PhD been while leading a biotechnology firm? You know, and if you knew you would end up there, would you have still gone and gotten a PhD? And maybe I'll add to this, you know, how'd you learn your business skills? (laughs) - Well, that's a personal question.. For me, yeah.. 00:35:27,400 I enjoyed getting a PhD.. I enjoy the science.. I enjoy the R&D and it does help running the company.. We are R&D-based company.. So I don't have to be the best scientist in our organization, and I'm not, but I have to know it enough to know who is, right? To ask the right questions and be able to manage it.. And so much of the success of our company is based on the quality of the science that we do and the medicine as well.. So yes, it's been helpful..

You do, as CEO have to manage, obviously the entire company.. Many of disciplines, you don't have any personal experience in.. Manufacturing, and for me, commercial.. You know, a human resource, so all the people issues.. Finance.. And so you just .... I've learned that kind of by osmosis.. I didn't do an MBA.. And, you know, when I worked for (mumbles) one of the benefits of that is they send you to training courses if they think you have some potential.. So, you know, I did some mini MBAs and things like that..

But those aren't really that.. I mean, they're pretty superficial.. So basically you learn things as you go and you get some exposure, you ask some questions and you learn.. My experience with most of this stuff is the principals are not that difficult, right? So, you know, the concept of a NPV, very straightforward.. It's very simple concept.. Sitting down to do one, not that complicated, but it takes some learning.. But what's crucial for that is the assumptions that you put into it.. And so being able to learn enough to say, "Okay, this is entirely dependent on the assumptions that go into it.. Let's question those assumptions." And the rest is math, then, you know, kind of going back to first principles, it gets you through a lot of things you don't have any formal training in.. - There's a related question, 00:37:29,584 which I think you've already answered, which is how can people who don't have PhDs be involved in the commercialization of research? - Well, we need people who are 00:37:40,557 involved in the commercialization..

The company needs .... I mean, even we don't have any products to sell yet to have a commercial group 'cause you have to start planning for how to commercialize things well in advance of when you actually have them.. You have to start .... You have to understand the markets.. I have one of the key things for companies that I've taught for a long time is you have to solve problems that actually exist not that you think exists.. And that's not only scientific problems and, you know, technical issues, it's commercial issues.. You know, is there a need for this product? How would it be used? Are there some flaws in your thinking? So even if you're technically successful, no one's gonna use it.. Right? And so you need to understand those issues.. So you need people who understand the market, who can interact with the prescribers and the physicians and the health plans who are gonna pay for this and Medicare and other agencies to understand whether .... what's important to them..

(mumbles) - George, without naming names, 00:38:47,860 can you give an example over the last 30 years or so of an example of that, where a product was developed of which there was no use because there wasn't a commercialization plan? - Oh, there've been many.. 00:39:01,860 And it .... Well, I gave you the recent one.. It's not that there's no use.. Like the PCSK9 inhibitors.. These are new drugs that are really potent in reducing LDL cholesterol, reducing cholesterol.. So for people who are not adequately controlled on statins, they can be a lifesaver.. And so there are two or three owners now on the market.. They are really good drugs, but they were priced at a level where all of the payer said, "No, thank you.. We're not paying for this..

The benefit to our patients does not merit that cost." And so they're actually used very little, and they are potentially lifesaving drugs.. And so that was an era, not in the product, but in how to-- - How to price it.. 00:39:48,357 - (mumbles) into the marketplace.. 00:39:53,190 Gilead, when they introduced their Hep C treatment, this a treatment that cured hepatitis C like 98 or 99% cure rate.. And I think the one or 2% are people just aren't compliant.. You have to take a pill every day for a period of time.. And they charged .... You know, I think initially they charge $40,000 for that treatment.. They got so much grief for that.. - They got a lot of grief..

00:40:20,190 - And they charged it (mumbles) 00:40:24,950 You know, basically it was $1,000 a pill, right? 'Cause you gotta take a pill once a day and then just divide it (mumbles) 1,000.. So people looked at the pills and said, "$1,000 for that?" - (mumbles) a pill.. Yeah.. 00:40:38,130 - So when you actually do the cost benefit (mumbles) 00:40:40,670 they save more money to the healthcare system by avoiding cancer and liver cirrhosis (mumbles) But it was cosmetic.. So they didn't do deal with that.. - They didn't deal with it well.. 00:40:51,032 - They were .... 00:40:52,830 Most of those patients on Medicaid and they didn't talk with the state Medicaid agencies and prepare them.. So they all had their budgets just completely ruined.. And so they pushed back..

So there are ways that you need to prepare the market to interact with payers that are crucial to the success of the product.. - George, can I ask you two quick questions 00:41:16,560 before we get cut up, which I think are good ones? One is, you know, who is a CEO or industry leader that you look up to besides yourself? - Ken Fraser.. Ken is the CEO of Merck.. 00:41:34,620 He is, I think, incredibly capable, decent, thoughtful, and has done an amazing job leading Merck to be a really innovative company.. So you know, I got to work with him back when I was at Biogen.. Jody Sure.. 00:41:50,960 - And have a huge amount of respect for Ken.. 00:41:53,363 So he's at the top of my list.. - And then I guess the final question that I'll go through 00:42:01,050 is what's your advice for someone looking to enter the biotech industry as an undergrad? Do you think that focusing on honing bio knowledge via undergraduate or graduate studies is important to do before entering industry? Or do you recommend entering the industry in college itself by an internship? - Look, I think you should do what you're passionate about 00:42:23,500 and what you enjoy because my experiences it's when you do that you do the best.. And so achieve excellence to the extent that you can in a field that's of interest to you..

So many different fields are relevant to biotech companies.. Biology, commercial, finance, legal, technical manufacturing, data sciences, so many ways to get involved in the industry.. Pick what you like and pick where you want, where you have some passion and where you don't mind, and actually enjoy spending 60, 70, 80 hours a week working on it.. (dramatic

music)..