Introduction and Guest Background

And today we are going to dive into all things AI, genetics, and the next evolution of human optimization with a true visionary. Our guest, Doctor Ranjan Nag, is an entrepreneur, AI pioneer, investor, and adjunct professor at Stanford School of Medicine.

His work with the R4 two group is accelerating innovations in biotech, computational biology and regenerative medicine, pushing the boundaries of what is possible in health and longevity.

Doctor nag, welcome to the show! I'm so excited to have this conversation with you today. Welcome to Doctor Talks, the podcast, where every episode leads to a healthier you.

Join us as we navigate the world of optimal health, uncovering groundbreaking strategies to conquer chronic disease. In each episode, we'll bring you the latest insights from leading health experts, medical innovators, and wellness warriors.

If you're seeking to transform your health journey, or if you're looking for answers to burning questions. You've come to the right place. Get ready to unlock the secrets of lifelong health and vitality.

This is Doctor Talks, real talk from real doctors on the issues that matter to you most. Hi everyone, and welcome back here to Rad Cars, where we explore the frontiers of radical longevity from the breakthroughs transforming our future.

I'm your host, Doctor Melissa Grell Peterson, and today we are going to dive into all things AI, genetics, and the next evolution of human optimization with a true visionary.

Our guest, Doctor Ranjan Nag, is an entrepreneur, AI pioneer, investor, and adjunct professor at Stanford School of Medicine. His work with the AR 42 Group is accelerating innovations in biotech, computational biology and regenerative medicine, pushing the boundaries of what is possible in health and longevity.

Doctor Nigg, welcome to the show. I'm so excited to have this conversation with you today. Thank you for having me. I'm really excited to I there's so much I want to cover.

So let's see. Let's kind of wrap a pretty bow and and and get some context. So you've got this incredible career the procedure. You know you're spanning AI, machine learning, biotechnology, genetics.

I want to know what first drew you into this kind of intersection of artificial intelligence and human health. Yeah, I've actually been working I think at this point 40 years, literally, you and I, we think to early adopter, I think my first system was in 1983 at Birmingham University, where we were doing telephone digit recognition, you know, just recognizing telephone digit.

And I used to tell people, oh, I'm trying to make this machine that can understand human speech. And they they didn't understand what I was talking about.

And they've just fall off their chair. Just a little telephone digit terms. So I said, and I mean, I got my inspiration really from watching Star Trek.

And of course, when I talk to people, I'm not sure which Star Trek they're thinking of. Sometimes I thinking about the movie. I'm thinking about the TV series, the original one with William Shatner.

Yes, exactly. Exactly. And a lot of the inventions of offer that mean being made now. But those days had not been

made. And when I was that I was doing electrical believe it, not as electrical.

I'm not, you know, an adjunct professor in medicine, but I started off the electrical engineer and said, wait, you mean we can actually do a project to do some of these things?

You know, this is final year undergraduate projects. Yeah, we're going to try. That's what my advisor said. And then, we built this thing to recognize telephone digits.

And then my first job was to it was a company called apricot not Apple. Apricot. It's apricot, which is a British laptop company. And they were trying to put speech recognition into a laptop.

This is in 84, 1984. Wow. I did like 4000 word vocabulary and you had to have a little space between each word. So it's getting into this all this technology.

And then Cambridge let me in to do a PhD in signal processing. Machine learning called it in those days. But really was I again my field was speech understanding speech. And and then basically I went to MIT to do AI for finance and and then came to Stanford, not the engineering department, not the computer science department, but the psychology department.

A little known fact in a lot of the modern AI is based on a technique known as neural networks. Is a computational models on how the neurons work. But computer science departments back in the day didn't really believe in that.

They were saying, well, how do we get because we don't have big data. And they were saying, how do we get small data into a machine? And then you talk to set up rules, or why you think this person's got diabetes is right.

Programed the rules into the computer. And of course, so many problems are so much more complex. You don't know what the rules are, correct? I have an accent, of course.

Longevity, aging we don't that the body's so complex and so round about the 80s, 90s you had this new era of data and say, well, let's collect the statistics from the data and see how it can model complex problems by looking at statistical models of the data.

That those kind of ideas were really done in other departments, not computer science. So engineering, electrical engineering, psychology, mathematics, other departments.

And then finally the computer scientist sort of came and came on board. So but after Birmingham, Cambridge, MIT, Stanford, no one never give me a job.

So of course, I was here in Silicon Valley. What do you do if you don't have a job in Silicon Valley? You can do things. That's right.

From AI and Speech Recognition to Biotech

So what did I invent? The first thing was worked on cursive handwriting recognition. Now, you're probably familiar with, you know, you can you may have an OCR package that converts your PDF into text, and that's very much easier problems.

There's a space around every letter, and it's all typewritten or things. But handwriting people are notorious in having bad handwriting and in cursive.

It's even more difficult because you don't know where one letter starts and one letter ends and you do a t cross. And so yeah, there's like problems. We start looking at these and then and so I started a company called lexicon at, at our peak we were three people and we sold that to Motorola.

And they made me do. The first thing they told me to do was that we need you. We've just invented texting, and we

need you to invent Chinese input systems because it's 20,000 characters and we don't know how to get them in the box.

So I said, I don't speak, read or write Chinese. And they said, we don't care. We've just bought your company, but we need you to invent, figure it out.

Right? So we did. We did learn like Chinese handwrite, Chinese speech and all these things and and then then invent first, invented the first. Then we wanted to crowdsource intelligence. So.

So how did it do that? So first invented the first mobile app store. There's eight years before Apple and said, well, instead of inventing every feature to go in the phone, let's crowd.

So let's have everybody else invent it. So I invented the first mobile app store in 1999. My only problem was there were no phones that could run apps, right?

So phones that could run apps. But I thought, you know, I had all these roadmaps is going to happen. But it took him instead of taking like 20 months like the first one took took it took ten years.

And then BlackBerry Rim, BlackBerry pull that company. And then then I went back to sort of speech recognition again. And then I was more of the advisor investor and then who bought that company.

So so I want to mature, I want to BlackBerry want to Apple the most arrogant phone company in each time horizon. And then they came the how do I get into biology you might ask?

You know, this is all this is all AI stuff, all engineering and AI stuff. Well, Stanford has a program, and I think this is a societal thing that's going to happen more, more prolifically is we're all going to live to the hundred.

And so universities are great educating 18 year olds for bachelor's degrees and 21 year olds from Masters and 26 year olds with PhDs and 27 year olds or MBAs and 28 year olds for MDS.

But if you're going to live to the hundred, yeah, maybe you need Reeducating in your 50s. That's right. So I got reeducated. So Stanford is about ten universities in the US and Cambridge universities are starting this year.

You can actually just go back to university. You know, Chicago has won, Harvard has won. The UT Austin has one. You just go back to university. You have to have a 30 year career and you go back and all you going to do the same thing the next 30 years as you did the last?

Possibly. Maybe. So you could go to the know the computer science department, see what they're doing that. Oh, are you going to try and do something else, do other things that my case, I took all the medical school courses and the genomics courses and start to get to know all the professors.

Then I started, well, getting good enough to actually teach some of the I teach longevity science at Stanford. I teach, I genes in ethics, and I also teach venture capital at Stanford University in the medical school, not the business school or the engineering department, but the medical school.

And those are the regular students. But also, I'm very glittery, and I was brought up in Europe where we didn't have to pay for education. And so I don't really believe I really get to expound my ideas to anyone who listened to them and explain how things work.

If I if I know how they work. And so people can actually take my courses in the evenings. These are Stanford's cheapest courses that $500. And so I teach, I teach, but there's an AI course I've taught 40 times.

Wow, evening. And anywhere anyone can tell you don't need to care, I don't I don't have to pass the test or do SATs to take that course. And so I also teach a longevity science course also in the evenings in addition to the regular students at Stanford.

So I really like imparting and it's not for altruistic reasons. The students give me ideas. Yeah. So these topics are aging science, longevity science.

You know, the first thing I say is I actually don't know the answer. I don't I don't know all the answers. But if you have a class room or group of people where everybody's from different specialisms, well, maybe collectively we know the answer.

Maybe together we can come up with the answer on each topic and the field. No medicine is a very, very wide field. And so really how do we move the ball forward.

And so the second way to move the ball forward is put your money where your mouth is. Right. And so I've been investing for about 25 years. I've got about 100 companies part owner of and said, well let's just professionalize that instead of just doing it by itself.

So really it started off 42, which is a venture firm and an institute. So a separate institute to pay the actors to visit. But again, I like to teach for free is I offered to institute.

We have seminars and programs. We have a summer means to where we we teach AI for free, and we put them on a longevity science project or a biotech project in the summer.

And we also invest in companies. So invest in really the earliest stages when it's just an idea. First check usually the only check just to get it off the ground.

And it's usually hands on. And a few companies I invest in. So that's my second person first personas are teachers. Second persona is I'm an investor.

And the third person, I'm still an inventor, so I still love inventing. And I like to be on the other side of the coin and have empathy with the entrepreneurs that I work with.

So I feel I've got to keep my hand in, really. I've got three companies that I've really worked on now. One is a Jamika, which is an aging vaccine using computational techniques.

Two is egg seana, which is trying to solve dry AMD this is age related macular degeneration. When you get like a fuzzy spot in your in your eye. And people have that.

But 80% of the people. Well the have the dry form, the wet form. There is a cure not very comfortable cure. It's an injection in the eye every month. Not that not very much fun, but the dry form, which most people, 80% people have, that there's really no cure for that.

And the third one is an AI Lifesciences app store. Super biotech. I where, you know, instead of writing code, I hate writing code. I mean, code should be like PowerPoint.

And we cut starting to get there now where you just upload data and click train. And it's sort of biotech, like AI libraries that you can use. And in the end you just write a sentence.

They tell me the combination drugs that will solve aging and they'll say, oh, you need these computational models, you need these data sets. And instead of trying to hold them together manually, you just it would just do it for you.

And it takes the code. I had the genetics framework in, artificial intelligence. So that's me in a, in a nutshell. Wow, wow. Any question on AI, So so you are the OG.

You are like right there. You've been in it since since the inception. You've helped to bring so many key AI developments forward over the last multiple decades.

And I love your journey. I love your story. I definitely want to dive into so many elements you have. You have just

piqued my curiosity with so many things that you've said.

You're fascinating first and foremost, I am so genuinely just honored that I get to sit and just, you know, mentor with you over this time together, because that's what I feel like, my honor, it's my honor, Melissa, I tell you.

I mean, I want to have a conversation off interview about, you know, what you're teaching with longevity sciences, because I run the Human Longevity Institute and we teach practitioners precision health and longevity medicine.

And it's like it's just there's there is such a need. And I love what you're doing. I'm so curious of of how what you're how you're approaching things and would love to get to bend your ear about that.

And so let's first gosh, oh my gosh. Okay. Let's use it. Something that I think is going to first and foremost pique our listeners, audience, which you talked about the aging vaccine.

So let's talk about this aging vaccine. Explain it to us for a moment. And I want to come back to some investing things. But let's let's try to know what the aging vaccine is.

So yes, so I'm a big believer setting big goals. Right. So this year imagine you know, 1983 and you're saying, oh, I'm going to build a machine that understands human speech.

Yeah. People say what are you talking about? That's impossible. Everyone's got a different accent. And it's the language is so complex. People don't speak in perfect grammar.

And, oh, you've got just this toy problem, this telephone digits. That's fine. You can do telephone digits, but you're not going to do real language. How are you going to do 20 years later?

It's on everyone's phone, right? 2000. Right. So first of all set the goal big. You can't you know, if you set the goal narrow then you will get a narrow result.

Right. And then people will laugh at you. They may laugh at you and say it's impossible. But time and time again we see things that are not impossible.

But they have to ask the right question. In fact, up 42, I'm not sure if you know why it's called a 42, but 42 it's a it's a parody from a book called Hitchhiker's Guide to the Galaxy, I love that.

Yeah. And the characters are looking for the secret to life universe and everything. And they finally find out the answer. And the answer is 42. But the only problem is they don't know what the question is.

So this is the set the question. Set the question what you want to actually do. So okay. So okay we want to know a lot of the questions are not living forever and solving aging.

But let's put some science around it and say yeah we have some concepts a vaccine for aging okay well I'm an engineer. How would that work? How would that work?

What does that even mean? Is, I mean, you just stop aging.

Teaching, Investing, and Building 42

Does that mean you reverse it now? And what does that mean? Is that something you have to take every year, like a flu vaccine or something, or or you just take once that's smallpox and just take it once and that's it.

And, and and what does that mean? You know, if you take it when you're five years old. E-5 for the rest of your life, so you ask these things and then from an engineering point of view, okay, let's sit down.

How would we do it? And as you probably know, is the FDA doesn't regard aging as an actual disease. And

actually lots of people don't regard it as a disease.

You can't get it even if you solve it won't be able to get a prescription for it. But we know that many diseases, the only common denominator is time age.

And we know the number one killer is the cod is cardiovascular disease. Big problem is people aging to older levels. And we're seeing dementia and Alzheimer's are creeping and where previously that what didn't register because people didn't get old enough.

And then of course cancer which is heterogeneous disparate. There are many type there's no not really a single cancers and hundreds of types of cancers and subtypes of cancer.

And how are we going to solve this? So I worked with my co-founder, Doctor Yasmin Cantor Multimedia, and said, look, we let's set this is our challenge is that she has a PhD in computational drug discovery.

So she's more on the drug side. I'm more on the I side and said, well, okay. The problem is obviously complicated and difficult. It's going to be difficult for us to think of it by ourselves, but how can we use the tools that we now have?

Even this in the last couple of years have popped up. How can we use the databases that we now have that didn't exist even five years ago? Never mind ten years ago?

So it's not that people were stupid in in the 1980s, 90s, 2000 when just didn't have the tools we all stand on the shoulders of others. Yes. Okay, so what we're trying to do at a Jamaica, which is the company that's trying to solve this, is let's break up the problem into parts, okay?

So okay, trying to solve aging all at once. That's certainly a goal. And some people are looking at that instead of looking at one disease at a time is there's something common that affects all the diseases all at once.

And they may well be, but how do we find those common things? But let's break it into smaller problem first. Just like my telephone digit example. So do the whole of language all at once, right?

Let's just recognize yes and no. Two words first. Oh then let's do ten digits. And so this is so let's break it down into three broad categories. Is one is cardiovascular.

Second is neurodegenerative. Third is cancer. So let's break it three broad problems. And let's start off with cancer. Because cancer is disparate many many different forms.

Can we actually come up with technology to find common pathways to as many cancers as possible. And then I put my engineering hot on as I talk to my biochemist friends as what?

You mean we're just trying to do one cancer at a time. But wait a minute. It metastasizes right, isn't it? Isn't it like a whack a mole problem? Yeah.

Okay. You fix one, but two. No, it's gone to the brain now. It's gone to the thyroid now. And, well, are we looking at a fundamentally flawed way? Should we be looking at groups?

Yeah. Can we attack it before it even gets there? And then can we extend that to every cat at the same time? So can we look at the gene expressions? I mean look at tumors.

You can now get human tumor cells and all the different types of cancers. And again let's start off with 30 cancers right. And I break the problem down. This is classic.

Engineers do this up and down into smaller problems until you can solve it. And so you break it down and say what are the common pathways across diseases.

It's possible. And which but that's a tricky one. So we use AI. And to do that is if you're trying to have a person do it by using their own mind is too difficult.

It's trying. But we now have machines that can do that for us and can read a million papers for us instead of all the articles that everyone's done. Look at all the databases and trick two is saying, okay, how do we speed this up?

Because, it takes 20 years and $1 billion to get a drug out. But so I'm firmly of the thesis of you know, it's not controversial thesis but it's like, well we've had 2500 drugs already made.

The FDA has approved another 5000 have gone through phase one which is the safety phase is correct. Whatever reason they didn't continue afterwards. But they're safe.

And then there's another 10,000 by other agencies around the world. Instead of inventing a new drug. Why do we start from an existing one? Yes. Yeah. Drug repurposing. Yeah.

So that wipes out ten years of development time. And instead of starting from fresh. No, no, we have companies that have investments in companies that have the other idea.

Let's start some completely new because nothing exists that works is that's that's one view. I said, well, let's look at the current thing. So when someone says to me, I found this chemical compound, I think it's going to solve whatever disease.

And the first thing I say, is there any existing drug that has a similar signature to the compound that you're thinking of? Yes, right. In the entire database.

So we don't have to invent this new one and go through the phase one trials, go through the all the whole thing. And so I'm skipping that stage and say, okay, which ones can be used in different combinations.

If you have 10,000 possibles and you even have two combinations, that's 100 million combinations, right? And you've got 300 triples. That's a trillion combinations.

So and can we find the right one to look at. So so basically go forward in that. And then basically then there's a concept of the vaccine. And the concept of a therapeutic idea is can you fix you once you've got the disease.

The idea can you stop you even get it in the first place? Again, simple problem is do the therapeutic first. The longevity revolution is about more than just searching online for a few hacks, or any one of us moving our biomarkers in the right direction.

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This is absolutely fantastic. Thank you for taking us through the process. And I don't want to stop your flow. But I do question that as we're we're looking at the pathways.

We're looking at the commonalities you mentioned earlier about okay, we're looking at the genetic expression. So what part of if at all this computational assessment is cross-referencing and inclusive of the external inputs from the Exposome.

So understanding of how right like are we seeing correlative patterns that are coming up in these disease processes that yes, they're affecting multiple pathways.

There's there's a internal physiological cellular signature. Right. What are the external parameters. Because I think ultimately that's where we continue.

And I'm hopeful that I will help with this. But I feel like that's where we continue to miss the mark.

The Aging Vaccine and Root-Cause Longevity Research

Like we'll have a molecule that yes, it's it's right on paper. It's right in the science. It's right in the lab. Yeah. It's not bio individual because it's not taking into consideration what's creating the inner terrain disturbance to begin with.

So how is that being looked at and considered in this process. Yeah. So there's a concept known as arrow types that some of the long ages, some of the kidney aged, some of the heart ages because of multiple reasons.

Be could be our lifestyle could be, as you said, the exposome could be the environment we're in, things that we do that we don't not supposed to do, bad habits that could be genetic in the like.

So the one I guess that's sort of now moving to the personalized medicine approach is a couple of theories. You know, you've got to balance the two approaches, right.

The vaccine approach is almost the opposite to personalized medicine. Can you take on everybody. Right. And what you have to try and do is cause like look at the causation correlations and most things in AI, and you'll see this in the newspapers and somebody will say, oh, we found the genetic that the genes for the genetic framework for being a criminal or something like that.

Right. A picture of your face. And I'll tell you, if you're going to be a criminal or not. Right. Or whether you're going to be a great podcasting host or whether you're you're going to be a, jet fighter fighter pilot instead, you know, tell you just from your face that usually those are what are known as correlations, not causation.

And that's a classic issue in medicine. And but but biochemical research is we see correlations and the scientists are very careful. We say this is correlated with something called the Bradford Hill analysis, which is about 70 years old at this point, which says, look, you know, you just see one chart that's not enough.

You've got to look at charts in every dimension. And so your question is, how do we account for every, you know, the other things that we're at now if, if, you know, if you're living in Vermont, you've got clean air versus living in Delhi where you have highly unclean, you know.

Yeah, IQ index at 400, it's got to be very different analysis. Right. And what we're lucky today, getting luckier is that now databases for that are popping up.

Some countries are more prolific than others. The UK in particular where now I'm I'm speaking from Palo Alto, California, I'm Californian and American, but I was brought up in the UK, so I have lots of links there, and the UK should be probably commended for being a bit more bit ahead of the game in trying to collect databases there a single course, a single payer health system a little bit easier.

Yes, they're still fragmented actually, but they've got the sort of framework to actually collect data from the population and, and the easier format.

And it's a it's a ethnically diverse population at this point. Yeah. Pretty good data. We get it from the UK Biobank out there. But you're getting other data.

So that's where the government programs where they can get thousands, hundreds and thousands, millions of data points compared with like the program, the Epub program at Stanford where they they measure everything about

me all the time.

But it's only about 100, 200 of us not to give blood every few months. You know, I have to, give, throat swabs. No swabs have been sequenced. Have to give poo.

But then I'll tell you about the poo until you after you signed the, Right. It's good a team. It's like. Oh, you want to know my microbiome, too? Okay.

Yeah, that's exactly. So they get very deep profiles on one person, right? But it's very difficult to get deep profiling in scale. We're starting to get bit.

And you're seeing all these companies and labs where people are taking control by themselves. Yeah. And also on the AI side, maybe a couple of years ago in these GPT systems, you asked you a medical question, just wouldn't answer.

These days I'm seeing it's answering and it's not a bad answer because it was sort of, you know, 80% there. And now it's the answers are not bad. And because the health care system is so expensive for many people, I think that's what's happening.

A lot of the questions are actually wellness questions. And what's the what's the advantage of the current AI system? They're trained on the entire internet.

And so they can pick up information. Now, the problem is they're trained on the entire internet. They can pick up bad information to. Correct. Yeah, but a lot of these companies putting in processes to try and filter out the bad in this big chunk of their activity is to try and filter out incorrect information.

So it's recondite issue. And so in my courses, I let my students use these AI systems to write their essays songs. They tell me they're writing them and sometimes they filter out the mistakes.

If they put, they were at least mistakes created by an AI system, they get negative marks. So being an industrial. So answer your question this week, I think we have the tools to sort of look at that.

And but the proof is in the the dirty secret of AI and drug discovery. There's no drug that's been released yet that's been invented by AI. Nothing's happened.

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I mean, I'm hearing more and more that especially in the health span landscape, it's really looking at drug repurposing. And so you're fast tracking the potential solutions.

And using this the beautiful computational analysis to to potentially get there much faster. As you're saying. So we could I mean, you said I hasn't developed a drug yet and now we have something kind of in play.

But I mean, I could could definitely help us find these solutions. How quickly do you think it can happen? Yeah, I think there's lots of phase two, lots of drugs in phase two right now.

And I think it could be a bit like the four minute mile. Now, Roger Bannister ran the mile in four minutes in the 1950s and no one had done it. Supposedly no one had done it. Doesn't really measure.

I don't think people are measuring, but, but since he did it, 20 people did it in nine months, right. So that's impossible. So I think there's going to be a next couple of years.

We're going to see 1 or 2 companies get out there, and then everyone will do it. And everyone who's not doing it is going to be using it. And they'll get a head start, because they're not going to have to go through all the the arrows in the back of using the week databases, the weak tools, that can be used be able to use the most advanced.

So you don't necessarily get loser advantages. You see this in tech. You know fast followers I guess Microsoft has always been though. Even Apple is a fast follower.

But sometimes the technology let other people get errors in the back and then it's ready, then jump, right? Yeah, Microsoft and Apple are both in that category, and I think we guys are going to see biotechs.

And a lot of a lot of us are getting painful. So starting now is not necessarily you're not necessarily losing. You can actually build on what other people have done.

And so I think ten years, which by biotech standards is short, if it's done from scratch, because you can imagine the, the issue is, the you still have to do the trials.

Yeah. Repurpose the trials go quicker and, you know, combinations. You can repurpose a drug if it's a single drug to something else. And the trial's going to be really quick if you're doing combinations and you have to test the combination. Yes.

It depends what you're testing. You know, almost ahead of time, depending on whether it's going to be all these toxicity databases of how drugs interact with each other.

So you know, almost ahead of time whether it works. What's unfortunate in traditional biotech, they'll spend the 15 to 18 years and then it fails. Yeah billion dollars. Right.

So a lot of things fail. And I don't think enough people understand the process at the time. And then what's kind of left on the floor that just didn't, didn't fully come out.

Some of the failures work. You know. You know, Viagra is the famous case where it didn't work for I guess it was blood pressure, but it worked for other things.

Yeah, even Keytruda, you know, is in that area, even GLP one inhibitors. But look for other things. Same thing. Yeah. So other thing. So the higher order bit is looking at now what's something that already has been made be used for something else.

And I think the way we're looking at a Jamaica is this cancer has got all the characteristics of multivariate problems, you know, lots of dimensions changing all at the same time. There's no one cancer.

If you can solve it for that, then you can do run the whole process for cardiovascular. And it gets easier as you go along. So as we know a lot of these are correlated.

You know, if you have a good heart, often it reduces your chance of cancer and vice versa. And like cancer drives gene aging, drives cancer, drives senescent cells, makes our cells older and those cells themselves make the other cells older.

So I think we like cancers is something to start off with. That's great. Yeah I make it a manageable problem you know. Oh we failed. We didn't solve aging but we solved cancer.

Oh gosh. Yeah. Well I love it so okay. So how where do you think you're at in your timeline with, with the three buckets that you guys are actively working on.

Yeah. So cancer is the furthest along. We've done tests on human cells 30 cancers. And so we're now trying to do again once again thinking about engineer.

What's the next milestone. Yeah. Trying to make a cancer proof mouse. So you can get a mouse where you can replace the immune system making replace telemetry lots of things now.

And replace them with the human equivalent with the mouse immune system, with human immune system, for example. And so, because mice you do experiments on mice notoriously they never work in humans.

Right? That's it. Because I'm not a mouse. My brain's a lot bigger. I'm a lot heavier, my muscles heavier, etc., etc., etc. and so not always the best model.

The next step is have it sort of dog trials. Right? So big, bigger. And then go to the phase one with the combination. So we've got like 30 cancers. And the trick is anyone can come up with stuff that kills cancer cells.

You know, you can come a point and acid and stuff like that. The problem is does it kill the normal cells too? Right. Yeah. And so we try to do the test so it kills the cancer cells but not the normal cells.

And so that's what we've got. And we've got the AI framework to compute that whole thing. We've done actual wet lab tests blinded. So we now use crazy.

It's not us. Doing is another way of doing it. And we are now just starting the whole thing again for cardiovascular. Just running the entire thing for cardiovascular.

And so can you actually do that? And you get the program and then we have a peptide. Again, these peptides are the things where you can get to the actual protein that you want to the cell.

And again, in the olden days it was a chemical sort of process and trial and error. And now it's a computational process. So we biology into engineering.

That's again the macro trend. So as computer scientists we cannot muscling into these fields. And of course interact with our colleagues. And of course the best people like Doctor Yasin, you know, they're now coming up, these people who know both magic, these Newton who knew no one, one area and you to sort of do a heavy lift to learn the other area.

Yeah.

Exposome, Personalized Medicine, and AI in Drug Discovery

The students coming out today, they're taking classes in both departments and getting both areas. And we've got get some very brilliant people coming through in the next 5 or 10 years are going to be much more able than crusty old people like me.

You're silly. But let's talk about that. And I know we've got a I only got a few minutes left with you. I don't want it to rush by, but I am curious. So from your perspective and again, you've you've been navigating this arc of this artificial intelligence for, for throughout its journey.

And now, like you said, we're at a time where it's not either or. People aren't in silos anymore. They're kind of coming up and learning, learning the language and the AI, along with health and and or other sectors simultaneously.

And so let's talk about not just in the learning environment, but as humans, as we are now all having access, direct access to AI that's getting better and better every day.

Philosophize on what you see as being possible. Like, how is I set to help or harm us? What do you think it's it's

going to be able to do. And I mean across just, just as humanity.

Right. So I'm making a bit more of a global statement versus just in research and development and things like that, which is already phenomenal. But yeah, I'm just curious on your your perspective as well.

I'm an optimist, maybe because I've been Americanized now everything's a glass half full versus when I was in Britain, everything was glass half empty.

And because there are doomsday scenarios that, you know, you'll have the Terminator or you have a high school student who will have the power to unleash a pathogen on the world that I mean, Bill Joy, who is the founder of Sun Microsystems, he was basically he was worried about that.

And it hasn't happened. He took the talk about that 30 years ago. But we're going to have that power. But just like we have computers that are now available to everyone, you know, you have great things happening.

You're getting this democratization. Yeah. Used to be. You going to meet your doctor? She wore the white coat and she told you what to do, and she said, oh, don't believe anything you read on the internet right now.

She says, well, random. What do you think it is? But she knows. I've spent two hours working on the looking at the internet. Right. And we've got a ten minute, we have ten minutes, a ten minute discussion with your family practitioner.

Yeah. It's going to be a bit more collaborative. It'll be a bit more collaborative where the patient, the individual will be have done their own research, maybe ahead of time with their discussion.

And it's going to be more of a discussion with the expert. Yeah. I mean, the experts seen 20,000 patients, but you can't just you can't get around and they can see almost instantly, what's wrong with you and what isn't wrong with you?

But if they can access your research that you've done already. Yeah. And, you know, it's like, well, could it be they know it's not that you don't smoke.

It could be that. No, it's not that you're not, not obese, etc., etc. all these things you worry about in your research, then you use the person as a consultant, right?

Yes, yes. Oh. Oh it might be that. Yeah. Let's double click on that one. So I think it's going to be much more collaborative going forward. Yes I love it so much more collaborative time okay.

So so as you're looking at everything coming out, I one of the things when you were giving an understanding of yourself as an educator, an investor and an inventor, what are some of the things that you as a, as AR 42 really looks at and considers investing in?

What are some of the. Yeah, well, we like ideas. Yeah, we like root cause, longevity ideas. We see a lot of things that come through that are individual diseases.

But I really look at like, like to look at things that could they cross across the spectrum a lot of things. So we have an investment in synesthesia, for example, which is looking at RNA regulation.

So no, the central dogma that DNA is in every cell DNA cause, it creates RNA. RNA creates proteins. Proteins tell ourselves what to do. But as we get older that cycle, this RNA regulation gets weaker.

So what's in this because it's I try to solve that. So that's now you can have an argument. Is that the right way or not. But that covers lots and lots of different things.

The the other one is epigenetic reprograming. We have an investment in turned bio, for example. And there's four

things I call the Yamanaka factors that if you turn cell, if you change them to cell.

Guzman's current age to zero age, which shouldn't surprise anyone when you get a 30 year old female and a 30 year old male, you get this creature. It's called a baby. It's a zero.

Why can't we do that for ourselves? We can trace cells, another group. But why can't we do that for ourselves? So again, it's cuts across the, the, the elements.

I mean there are other different. And then we sort of look at inflection points. We have some gene editing companies for example, which I mean the again, the dirty secret gene editing room, we can only edit one genes.

A lot of the success cases of these monogenic diseases, sickle cell anemia, which only one gene fix it, the whole disease goes away. But most diseases not lots of diseases a multi multi gene a long tail of genes.

So you can't one it's not going to fix it. So we need a second second generation gene editing companies to to come through. And then there's finally science acceleration.

Right. So supervisor Ise in that area is a how can accelerate science by 50 x right. Yeah. The models the AI. So it's just drag and drop instead of trying to.

And then computational models. You know you just heard this AI system from China that was 50 times faster. How can we do that across the, in the, in the AI life science journey.

So, so as all of this starts to drop in and it is just adopted as a normal way that we are creating living being human, you know, running research labs.

It's just it's just everywhere in humanity. What what do you see as possible in Healthspan lifespan extension? Like what do you what do you think will become the new norm as far as how long we're living, how well we're living.

So in this in the US, the average age of death for males is 76, which is actually dropped from 78. And I think that was the opioid crisis. My prediction the next few years it's slowly going to increase.

I think GLP one will actually increase the age naturally across the population. The key word being average. Those of you statisticians listening because there's more people hitting the age of 100 than ever before.

So even though the average is dropped, more people are hitting the age of 100. Unfortunately is seeing it now by coastal East coast, West coast. If you go in the Midwest, it's not as strong that effect.

So certainly getting to 100, I think if you behave yourself there's much more education there, new treatment ideas. GLP one's going to be a big push. It's going to be more chance of getting to 100.

I mean, the Boston Marathon, which I ran on bragging about my brand last year, but in 1970, only a thousand people ran it. Women were not allowed to run it. Too dangerous.

Now 40,000 people run it regularly every year. This, this. We're not really seeing what that generation is going to happen in the next 20, 30 years where people, these, these extreme athletes are not limited to professional athletes, the limited the amateurs are getting to the same level.

And but the issue is, if you look at many biological phenomena, they tend to terminate like 150. And if you last that long, you don't get by a car and you behave yourself, even if you keep going.

No one's got past 122. The oldest living pay was one six 160. Now she lives in Brazil. A couple people died last year. They got to 116. Like telomeres.

These things, the ends of your chromosomes, they get smaller and smaller. The plot it out. It seems to end around

115 or so. Which maps exactly to what how the eventually.

So you're going to need some of these more radical ideas epigenetic reprograming gene editing to get past that. Yeah, past that 115 barrier. Even just getting to 115, we get the probability is going to increase.

So I think, you know, I think there'll be some quantum jumps in the next 1015. It just by GLP one, which is not even an aging drug, is just really getting people.

And my favorites, I teach on peptides every day. I have Peptide University and I love teaching about microdosing of GLP one and all the different applications.

And there are some amazing longevity benefits just with that and multiple benefits to the system. So it is exciting that we're in this really rapidly evolving time where information is is being able to be give us insight of how things can be applied and we can get new results right, kind of know better, do better type of thing.

Future of Longevity, Personal Habits, and Closing Remarks

So I love it. And so let me ask you, what is your personal longevity vision. So how long how well like what does your longevity vision for your life look like.

Yeah. So no that's now my life. So I'm not just it's not just an interest case. No. But I put $50 million into it from the venture fund already. And, teach it and research in it and start inventing in this space.

So it's not just looking afar. I'm jumping really into the space. And I think you do jump in the space. You probably figure out now whether we're clever enough to invest in is another question, but we'll probably see anything that would work well, that will work.

We'll probably say ten, 15 years before it hits mainstream. And so that's why I think now that's available to everybody, though at this point, this white coat thing's now just moving away.

You got access to something called the web now and there's something cool to see. And I personally, if you ask me now, what do I actually do? I'm a runner.

So I think run is the most. If you can run, it's probably the most efficient way to get the heart rate up to this way to lots. You get lots of mechanical benefits the in your body as long as you don't get injured.

So as you get older you get higher risk of injury risk. So you have to sort of take a few steps of longer recovery times. And so that's my main thing on the supplement side, I've tried most supplements.

They might work, but I don't notice any differently. Maybe maybe I don't get cancer 20 years from now. But so I like things that's shown immediate benefit, and the only thing I've found is slow release.

Alpha lipoic acid, which makes me seems to make me less hungry. And Ruggeri a c driftless pearls which bit too much information, but it's still comes out like exposed to, you know, within a couple of days and then zinc occasionally when I catch a cold, if you feel the hint of a cold thing, seem to solve it, you know, very, very quickly and lots of these other things, I make a fish oil, I have that, but I don't notice any difference.

I try lots of different things. I go take lots of tests and measure things, and that's probably like the recommendation. Now try and check yourself into a trial that you get that gives you the data back.

Yeah. It's hunt thousands of trials on clinicaltrials.gov. It is one maybe you did somebody probably doing a diabetes one. And then they you just get the data back.

And what's interesting, you look at the data and he encourages you to be a yeah it teaches you a lot about yourself. Yeah, yeah, yeah. What it says on the high end.

The only I better stop eating ice cream. Right. You know, I, I'm like everyone else. I'm always falling off the wagon. I like chocolate cake. I like ice cream.

I can kind of justify it because it makes me happy. And I think if you're miserable, you don't get to live a long time. That's right. It's it's it's the moderation of it all.

And, I mean, you truly are living a life of purpose, you know? And one of the things that I just want to highlight that you do very innately is what centenarians are known for, which is they they hold such forward thinking.

So they're always looking ahead. And and you've been looking ahead your, your entire career. You're you are doing that big like you said, set the goal big.

Right. So I call it ten thing. But I think you even said like 50. And it's like that whole quantum leap, that quantum jump. And so that's where you let yourself go.

So you're looking ahead and that already is informing your physiology that there is so much more that's waiting for you. And that is such a beautiful longevity hack just in and of itself.

And so you're you're living testament to all of it. So I just want to thank you I want to keep talking to you. All right. So from an educator standpoint to two last things, we're going to wrap up.

What is your favorite or your what would you recommend as your as your book of choice or books of choice right now for people interested in longevity, I would recommend I'm a runner, so I know a lot of people expect me to, you know, one of these popular books, but I would there's a book called The Science of Running.

Okay. Yes. And I've read all the running books and but that book is the the best one, I think. And that tells you how to optimize your running and, get the best out and get faster and faster, you know, get Boston.

I mean, I used to be a couch potato. Now I'm running Boston Marathon, so. And I feel the biggest impact is running is the most important. And I think the other one is probably is an old book, but but a popular book.

Tim Ferriss wrote a book called The Four Hour Body. It's probably like 20 years old now. Yeah. And I think he's got lots of tricks and tips in that. It's a good one, and that the quite practical and pragmatic, though I like that was still an old book, I think.

But at this point. But, still, I think the still good when. Yeah, yeah, yeah. When it comes to basic biology and what the body needs. Right. And just some, some best practices of I love how he talks in that book.

And it really does some sound things to stabilize blood sugar. And just like in very basic things that move the needle so much. So that's a good one I love it. Great, right? Yeah. Yeah.

People don't bring that up usually. It's usually one of the more modern authors. But I like still like that one is very the good one. Yeah. But solid.

Well you have and continue to leave quite a legacy. I tell you what I am thrilled to get to continue to follow your work. So doctor and I where would people do you want them to go to R 42.

Where can they find out? And again you said there's there's a there's free education over there and things like that. So hour 42. Yeah I forgot to group.com like Google may run John Nog.

That might be you might not be able to remember the spelling, but it probably Google gets me gets me a Stanford Ranger knocks down for the courses that they have.

They for Stanford. They've quite a number of free symposiums like send me personally I like to do the cheap ones. These like they do charge a few hundred dollars rather than thousands of dollars.

So I think that's the best way. Stanford and R 42 is probably the best way to program it. Well, we will make sure to have those links in the show notes below.

Wow. Well, we're coming to the end of yet another fascinating conversation. It leaves me more hopeful for the future. I love you know. I love that we are in a time that we can leverage incredible tools to help us really simplify the complexities and get clarity on the things that we can do more of, and the things that we can do less of to truly show up to life with greater states of vital and aliveness every single day.

And that's in large part to you, Doctor Nag. And the work that you've done, the foundation you've laid, and also how you're helping to shape and continue to educate and inform future generations.

So thank you very much. Again and to all of our listeners. Listen, if you want to meet and listen to amazing minds like this brilliant man, please join us as we have our ten year anniversary this summer at Rad Fest.

We're going to be out in, we're going to be out in Nevada, and we are going to have such an incredible group of experts and enthusiasts alike that get to come together in community to really explore the science and the solutions to live better today for longer, more vital tomorrow.

So thanks for tuning in. Like, subscribe, share, do all the things. Continue to spread this information out there because we're all in it together and we all have the opportunity to inspire one another to know that more is possible.

Just like Roger Bannister, we all need to know it is possible and aging is optional, especially if we might have an aging vaccine around the corner. So keep an eye on Doctor Meg's work.

And until next time. Stay bold, stay curious, and go express your greatest states of aliveness. I'm doctor Melissa. Take care. Thank you for tuning in to Doctor Talks.

We hope today's episode has enlightened and inspired you on your path to optimal health. Each day is a new opportunity to make choices that empower your well-being.

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