

# When it Mattered

## Episode 28: Dr. Michelle Longmire

Chitra Ragavan: Born in a family of scientists, her grandfather worked with Robert Oppenheimer on the hydrogen bomb. Dr. Michelle Longmire is a rising star in the science and technology field, but throughout her life and career, Dr. Longmire has found herself underestimated as she has competed fiercely to break the mold in male dominated sports and careers. In sports, she became a champion soccer player and team leader and in medicine, Dr. Longmire is a Stanford educated practicing dermatologist and expert in the genetic origins of certain fatal diseases.

Chitra Ragavan: Hello everyone. I'm Chitra Ragavan and this is When It Mattered. This episode is brought to you by Goodstory, an advisory firm helping technology startups find their narrative. Dr. Michelle Longmire also has broken the founder mold in Silicon Valley where female founders are scarce. Her multimillion dollar digital health startup is transforming the way clinical trials are conducted globally. Joining me now is Michelle Longmire, CEO and Co-Founder of the digital health platform, Medable. Dr Longmire, welcome to the podcast.

Dr. Longmire: Thank you so much. It's really great to be here.

Chitra Ragavan: You come from an extraordinary family of scientists with deep ties to the Los Alamos National Laboratories, home of the Manhattan project and creation of the atomic bomb. Let's talk with your late grandfather Conrad Longmire. Tell us a little bit about him.

Dr. Longmire: Sure. So my grandfather, Conrad, was a nuclear physicist and he was perhaps most well known for his work in thermonuclear weapons where he was a part of a scientific team that developed the hydrogen bomb and this was a really fascinating time in history in the early fifties where Los Alamos was actually a secret community and you had leading scientists from all over the world working together to achieve these kind of new high scientific horizons and he was a part of that. He was also an expert in electromagnetic pulse theory.

Chitra Ragavan: And did you know him? Was he alive when you were growing up and recently?

Dr. Longmire: Absolutely. I had a wonderful childhood. I spent quite a bit of time with my grandfather. He had retired to Santa Barbara, California and I spent summers there with my grandmother and grandfather and really had the opportunity to understand him as a person which was just a wonderful way to grow up.

Chitra Ragavan: Now your grandpa died of multiple myelomas which is a cancer of the plasma cells and one potential cause is exposure to radiation. Did his work in any way contribute to his death?

Dr. Longmire: It's hard to say because it was quite a while afterward with regard to when he developed multiple myeloma, that was in his late eighties. A lot of the work he did where he was around nuclear material was in his twenties but he did have a really interesting opportunity to be at Bikini Atoll where they were detonating weapons. So it's hard to know but my suspicion would be that it was not necessarily a contributor.

Chitra Ragavan: Your mother, Victoria also is a distinguished scientist. Tell us about her.

Dr. Longmire: Sure. So my mom is a plutonium expert and she is a radiochemist who was really among the very first group of women to be able to perform chemistry in one of the core facilities in Los Alamos Labs. So, given that she works with fissile material and she's my mom, I like to call her my hot mama but she's just a phenomenal inspiration in terms of breaking the mold for the workforce, showing that women are so capable and can work alongside and really lead any group of people and throughout her career she had a lot of success in radiochemistry.

Chitra Ragavan: And your dad's no slacker either. He's the son of Conrad Longmire and tell us about him.

Dr. Longmire: Sure. So my dad is a really interesting person. I think I'm very fortunate to have had really great mentors in my parents from a scientific perspective. My father is an expert in recombinant DNA technology and he is also a lover, and lifelong lover of birds of prey. So when he was a child, he was a self-taught falconer and taught himself how to trap birds and without harming them and then actually fly birds and hunt them and he went on to become certified by the World Wildlife Foundation to actually raise endangered species. So, I grew up with Peregrine falcons and Gyrfalcons and

had the opportunity to go into the deserts of Northern New Mexico and hunt ducks with my father and our Peregrine and Gyrfalcons and one of the really interesting things about my father is that he combined that passion for birds with his own work in genetics and he was a part of the Human Genome Project at Los Alamos Labs, but actually did his PhD in developing an assay that was used to test the sex of birds so that they could be bred in captivity.

Dr. Longmire: So he developed a test that they could use on blood to determine if a whooping crane was male or female and in looking at these birds, you cannot determine the gender and this test actually enabled the successful breeding of whooping cranes in captivity at a time when the whooping crane population in North America was extremely low. So I think some of the takeaways from my childhood are really this work is not a separate life but it's taking what you're passionate about and you love and making an impact through your work in that domain and I think my dad really embodies it.

Chitra Ragavan: So what was your childhood like being surrounded by these incredible scientists of extraordinary caliber and how did you feed off all this talent around you to become who you are today? What was young Michelle Longmire like?

Dr. Longmire: That's a great question. I think my parents would probably say I was very curious. I think in that setting you're not thinking, wow, these extremely accomplished people. Realistically, these are your parents and this is your everyday environment. One certain aspect of it is that on a daily basis, I was engaged in science and it was a big part of my upbringing. We were talking about it at the dinner table. My dad often shared a lot of the progress in the Human Genome Project and there was just this constant kind of hunger for discovery and invention.

Dr. Longmire: There was just a part of daily life and in fact I think back to my science fair projects and I and my dad, we always work together for almost a year on the annual science fair project. One of them that stands out to me was he was teaching me genetics and I loved hamsters. So I had a couple of hamsters and he had the wild idea, well let's breed hamsters for multiple generations and look at the Mendelian inheritance patterns to determine if the hamster coat length is dominant or recessive in inheritance. So my science fair project involved breeding four or five generations of hamsters and then mapping out all of the coat patterns to determine the inheritance pattern and so it's just an existence about discovery and learning and where I think deductive reasoning becomes just a big

part of how you think and operate in the world and I'm really grateful for that.

Chitra Ragavan: I think it goes without saying that there aren't a lot of families in the world that do four generations of hamster breeding for a school science project.

Dr. Longmire: Right. It's probably today would not be something people would want to accept as a science fair project but this was a couple of decades ago. So, but yeah, it definitely was an incredible way to learn just seeing the world and understanding the world firsthand.

Chitra Ragavan: And so what was your childhood like? Were you a bit of a tomboy? I mean, what were you like?

Dr. Longmire: I would say that I loved a lot of things that are traditionally or typically considered more feminine. I love fashion since the time I was very young and also I really love physical activity and I loved competition. So when I was young, I was a dirt bike racer. I competed in the Northern New Mexico Dirt Bike Circuit and I have photos of me with trophies that were taller than I was. I wrote a little Peewee 50 Honda dirt bike and raced all over in New Mexico.

Dr. Longmire: I also just absolutely loved competing physically. So initially I competed in gymnastics and then I went on actually to play coed ice hockey where I loved to skate out on the ice with both females and males and really that intensity of the sport and then went on to play soccer. So I think as a little girl, I had a number of different traits from curiosity to a love of beauty and aesthetics but also a really deep passion for competition and physical activity.

Chitra Ragavan: And was that difficult to be taken seriously especially when you were competing in soccer and you've kind of alluded to the fact that you've constantly been underestimated in your life. Why was that and what was that experience like?

Dr. Longmire: Sure. So I think you have this idea of yourself like you can really do anything and I think that was given to me by my parents and not in a cocky sense but really just if you work hard enough and you put enough into it, you can really accomplish a lot more than people might guess and so, when I was first competing in sports, I was also very small. I was playing coed hockey and I was less than a hundred pounds. So I think people saw me as fairly small and weren't so sure about my capabilities and then I would get on the ice and I was really fast and I was probably meaner than most and loved to compete and so, being underestimated actually I think is a

tremendous advantage because then when you surprise people with what you're capable of, it's really an aha moment that generates a lot of opportunity to reset what's possible and certainly that was my experience in playing sports, largely because I was a woman or female competing in male sports and I was also kind of tiny when I was younger.

Dr. Longmire: So I think that combination of traits led people to not be so sure and then I'd get on the ice and just show him what I could really do.

Chitra Ragavan: And it sounds like Los Alamos was really a great place for you, really different than say the ivory towers of Harvard or Stanford where you eventually headed.

Dr. Longmire: Yeah, I mean I think what is really wonderful about Los Alamos and I've spent a lot of time now in Silicon Valley and at Stanford which are also fantastic communities but what stands out about Los Alamos is that it's really about discovery. So in the community, the heroes in the community are physicists and chemists and biologists, Nobel prize winners, people who really value bringing new insight to humanity and I think when you compare that to Silicon Valley where we really value disruption, we value, I think certainly value wealth. Los Alamos, I feel like, has this purity around scientific discovery that is very rare and was a wonderful place to grow up as a result of that.

Chitra Ragavan: Tell me a little bit about your career in medicine and especially how you became interested in dermatology which by the way also is somewhat, correct me if I'm wrong, a somewhat underrated field of medicine but really a very important field.

Dr. Longmire: Sure. So in medical school, I was very interested in aging. So when I was thinking about what I was going to do my residency in, I was really looking at who I could do research with or with whom I could do research and I discovered a researcher who's very prominent in the world of epigenetics and also was exploring aging and his name is Howard Chang and he was at Stanford.

Chitra Ragavan: And for people who don't know what epigenetics is, give us a brief definition.

Dr. Longmire: Sure. So epigenetics versus genetics is kind of like genetics is say you've got this library with all of these books and these books contain a lot of information that's going to dictate who we are, what we look like, potentially the diseases we develop. Epigenetics is that set of books that's open and on the table that's actually actively

what you know and what your genome is expressing and so it's much more the actual potent part of the genome that's actively being used to determine health and disease in any individual and aging is a really interesting condition when you think about it from epigenetics because a lot of the way we live our life actually will impact our epigenetics. So aging given, it can have variation in terms of fast, slow, et cetera, is largely felt to be an epigenetic phenomenon.

Dr. Longmire: And so when I was in medical school, I was very interested in aging and wanted to do research with Howard Chang at Stanford. So I prioritized dermatology. He's a dermatologist and really had my eyes set on going and working in his lab and was very fortunate to be able to make that happen and to your point, dermatology is a bit underestimated. I don't think people know that it's very competitive as a medical specialty and it's one of the oldest specialties because it's a field of visual diagnosis and so yeah, there's over 16,000 dermatologic conditions and diseases.

Chitra Ragavan: And tell us a little bit about the work that you did in the clinical and in the research and academic settings that you were working on a particular set of problems.

Dr. Longmire: Sure. So at Stanford through my dermatology residency and I was in Howard's lab, we were looking at identical twins and trying to understand what about the epigenome differs in identical twins because you've got the same genetic background. So I was specifically looking at a disease called systemic sclerosis which is an autoimmune disease that impacts largely women on a nine to one basis and I was looking at identical twins, both of whom have the disease or one would have the disease and the other wouldn't and looking at the epigenome as a resource to understand why it was that the person had the condition and what parts of their lifestyle were actually impacting the manifestation of disease.

Chitra Ragavan: Got it and how did the work that you did at Stanford result in your idea to disrupt the field of clinical trials and to co-found your company, Medable?

Dr. Longmire: So, when I was doing my research, I was trying to find patients all over the world. I was researching a rare disease. I was researching the rarest subset of patients with this disease given that we're also looking for identical twins. Through that, I realized, wow, it's really hard to recruit patients for clinical research and additionally, with the epigenome, it's not just the clinical data that we need. So say you come to the doctor every four weeks or every six weeks and

you're providing information to your physician, that's not enough detail about your life to help us understand the epigenome. So we needed a capability of capturing data from patients in their everyday life, very similar to type of data you may have on your mobile device, location, weather, the various factors you may be exposed to on a daily basis and so it was really through this research that I realized, one, we need new technologies to help connect with patients worldwide.

Dr. Longmire: Two, we need to be capturing data for research anytime, anywhere in the patient's everyday life and natural setting and then three, we need the analytics tools that are going to help us extract signal from noise across what are very large datasets when you think about the broad set of data that we would be capturing if we did it continuously from someone's everyday life and it was really through that realization and firsthand experience that I thought, okay, the world needs a new set of tools to advance research and that this set of tools will help us in an era of personalized medicine. It will help us in an era where the epigenome becomes a diagnostic. It will help us in an era where diagnostics like the microbiome, which are also very dynamic, we'll be able to leverage these tools to actually use those types of diagnostics.

Chitra Ragavan: So tell us how Medable is trying to solve some of the problems with clinical trials today. What does the platform do?

Dr. Longmire: Clinical trials and just the process of bringing a new medication to patients is an extremely long and expensive process. So right now, one of the things that I find most inspiring about the work we do at Medable is that we're shortening the timeline to determine if a medication is safe and effective. The current timeline is 12 years. So, if you were to be diagnosed with a condition that was not curable, you'd really have to wait potentially 12 years if there was something in the lab before it would get into the market and you could actually be prescribed the medication.

Dr. Longmire: And so at Medable, we're actually reducing these timelines by enabling participation across the world where you can recruit patients and they can actively participate through their own mobile device. By increasing access we reduce the timelines dramatically and then the second part of what we do is we actually capture that data in real time so that we can determine if a drug or an intervention is safe and effective instantaneously across the population versus waiting many months or years for that data to be aggregated and analyzed.

Chitra Ragavan: Well, one of the problems that's been widely reported and written about in terms of clinical trials today also is the vast underrepresentation of women and minorities in these clinical trials. The access is very limited to certain groups, demographic groups and it has a real world impact on the outcome of these trials and sort of the medications and treatments that emerge from that. Could you talk a little bit about that and then how Medable would attempt to solve that problem?

Dr. Longmire: Absolutely. So I think you really highlighted an incredibly important reality. So you look at something like the Framingham heart study and this was largely in Caucasian men, just as one example. A number in the majority of clinical trials are deriving safety and efficacy of medications from just the participating pool which in general does not have enough diversity. For example, the United States has a very diverse population. Medications are prescribed across a very broad set of patients but clinical trial diversity is in general 93% Caucasian participants just as one data point. So, by opening the door to have access and actively improving diversity in clinical trials, I think we can make a credible impact to understanding how medications work and if they're actually safe and effective in a much broader set of patients.

Chitra Ragavan: So with Medable and other companies kind of really disrupting this whole space through technology, what would that world of clinical trials look like, say, in the coming decade?

Dr. Longmire: Our mission is to reduce the clinical trial timeline by half. So we would take that timeline of 12 years to six years and really what that would mean over the next decade is that we would be able to get effective therapies to patients faster. Additionally, in an era of personalized medicine, this becomes even more important. So we're currently working with biotech companies that have therapies that are specific to gene variants. So take for example, you have macular degeneration. Some technology company that we're working with has a therapy that only applies to 2% of patients with macular degeneration. That's due to a specific genetic cause. How are we going to find that 2% of patients?

Dr. Longmire: So we're actively working on technologies that screen patients for these genetic variants out in their everyday life and therefore we're able to impact the timelines for personalized medicines dramatically by identifying patients with those gene variants, getting them into the personalized medicine clinical trials and then actually being able to determine if those interventions are effective for patients. So I think fast forward a decade, we'll be able to reduce the timelines,



get more effective therapies into the market and ideally actually open the door for an era of personalized medicine.

Chitra Ragavan: And in addition to trying to revolutionize clinical trials, you're also involved in another data-driven effort called Digitome. What is that project and what's the goal of it?

Dr. Longmire: So right now I think everyone in tech and in healthcare are inspired by how data can drive things forward faster. The Digitome is an effort where we're trying to create a digital representation of human health and disease that is a data common across all of the Medable users and clients and partners. So therefore, if we're doing a study in rheumatoid arthritis, say, for a particular partner and with another partner, I'm doing a study in psoriasis, we're actually able to combine those data sets to understand the overlap of disease across our partners and really begin to develop a data common that can be used as a resource to drive a deeper understanding of medical conditions.

Chitra Ragavan: So, Medable is kind of an example of just this overarching global phenomenon and trend of the platform economy where the whole world consists of these platforms whether it's Uber and Lyft with transportation or Airbnb or in the case of clinical trials, Medable and so there are these marketplace that are being created where there's direct interaction and with clinical trials, it could be direct interaction between patients and doctors who are conducting these trials without the middlemen who often take a huge cut of profits, et cetera. But how does that work in healthcare given the incredible amount of data privacy that is required to create this kind of public, not public but massive databases where people can collaborate across fields, across lines to be able to find commonalities or conclusions that might transform medicine?

Dr. Longmire: Sure. I think what you describe is a really important kind of advancement of human society over the last decade, right? It's this platform plus network. If you look at Airbnb, you've got a platform plus a network of people who have homes and people who want to stay in those homes. LinkedIn, it's a platform plus a network of professionals and I think Uber, platform plus a network of drivers and riders. Certainly we see that opportunity in clinical trials and we see it to be an enormous opportunity. So we are providing a platform and we're creating a network of patients, caregivers, nurses, clinicians in that entire kind of ecosystem that would enable a clinical trial in a way that would be much faster and could in fact be driven by sub gig economy. So you could imagine a nurse is able to just tap into the Medable platform and be a part of a clinical

trial versus going through a broad network or a broad partner to your point about reducing the middlemen and improving the cost.

Dr. Longmire: So, certainly I think there's a platform plus network opportunity for clinical trials and I think as we look at that over time, it could end up looking a lot like the platforms plus network we're all familiar with in other industries. You raise a great point, which is one, what do we do on data privacy? I think the other point that's important is how do we know as people are plugging into this that they're qualified to provide that type of care and so these are actually efforts that we have internally to address this.

Dr. Longmire: On the data privacy side, we put a tremendous amount of time and energy into ensuring globally we're able to provide secure data and that patients are able to actually control access to that data, provision ccess to it and be able to share that out will with their healthcare providers. I think that's an important step forward and versus where we're at in medicine today, which is really patients don't have a lot of access to their data.

Dr. Longmire: I think the other part of it is creating a broad network. We're looking at technologies where if you're a nurse and you're providing care in a clinical trial, we have workflows that ensure that that person is qualified. We have data reviews that are automated that ensure that the data being captured is high quality. So yeah, it's certainly not as easy to do in healthcare but it can be done and I think that the value it will deliver to be able to accelerate drug development is so enormous that it's something we really need to push forward with.

Chitra Ragavan: Did you have a chance to discuss your idea and the work that you're doing and your startup with your grandfather before he died?

Dr. Longmire: Really, I didn't have much of an opportunity at that point but I certainly had many discussions with him about life in Los Alamos and what it was like to be on such a strong scientific team and just really learn from him this process of deductive reasoning, learned a lot from him about math and physics. Unfortunately, didn't have the opportunity to talk with him about my company at that point is he passed away shortly before we really started getting things off the ground.

Chitra Ragavan: Looking back sort of on this rich background that he gave you, your parents have given you in science and that's sort of this fertile development area grounds for you as a doctor and as a scientist and as a researcher, what would you say to your younger self

about the journey that you've made to break barriers for women including in sports and of course in STEM?

Dr. Longmire: I think really it's about find a way and take that risk and it's probably a cliché but don't let anyone tell you you can't do something. Just really put everything you have in it and know that you're investing your best and know that you continue to become more and more of an expert or more and more qualified and over time, that will drive what you ultimately want to achieve. So, I think it's really about find a way. There's always a way forward and I see that every day being a CEO of a company. Oftentimes you're wondering what am I going to do? It seems like we don't have many options to solve this very hard problem but time and again, I see there is a solution and you can find a way forward.

Chitra Ragavan: And if your grandfather were here today, what would you say to him about what he taught you the most?

Dr. Longmire: You know what? I really believe that we should be solving hard problems and I think I learned that from my grandfather. I think as an entrepreneur and being in Silicon Valley, we can see a number of different opportunities for how we invest our time and I think we should really aim to solve hard problems that bring a lot of value to humanity and what I learned through my grandfather was that through a team, a dedicated team of experts, you really can solve problems that seemed impossible to solve beforehand. I think that was something that growing up in Los Alamos, I was shown time and time again and it is extremely valuable to keep in mind with the right team, a team of experts who are really dedicated and mission driven, you can solve very hard problems.

Chitra Ragavan: Awesome. Michelle, thank you so much for joining us today and for sharing your story. It's just been a great conversation.

Dr. Longmire: Thank you Chitra. It was really such an honor and very happy to have had the opportunities to speak with you today.

Chitra Ragavan: Dr Michelle Longmire is continuing her family tradition of academic and scientific excellence. She's the CEO and co-founder of Medable, a Palo Alto based startup that's disrupting the field of clinical trials. This is When It Mattered and I'm Chitra Ragavan.

Chitra Ragavan: Thank you for listening to When It Mattered. Don't forget to subscribe on Apple podcasts or your preferred podcast platform and if you like the show, please rate at five stars, leave a review and do recommend it to your friends, family, and colleagues.

Chitra Ragavan: When It Mattered is a weekly leadership podcast produced by Goodstory, an advisory firm helping technology startups find their narrative. For questions, comments, and transcripts, please visit our website at [goodstory.io](http://goodstory.io) or send us an email at [podcast@goodstory.io](mailto:podcast@goodstory.io). Our producer is Jeremy Corr, Founder and CEO of Executive Podcasting Solutions. Our theme song is composed by Jack Yagerline. Join us next week for another edition of When It Mattered. I'll see you then.