Will Sequencing Your Genes Change The Way You Live — And Die?

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Speaker: Richard Resnick

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About Richard Resnick's TEDTalk

In this talk, Richard Resnick shows how cheap and fast genome sequencing is about to turn health care (even insurance, and politics) upside down.

“Everybody...could live an extra five, ten, twenty years just because of this one thing.”

About Richard Resnick

Richard Resnick is CEO of Genome Quest, a company that builds software to support genomic medicine — research and individualized treatments that take advantage of cheap and accessible genome processing. He was previously CEO of Mosaic Bioinformatics; before becoming a bio-entrepreneur, he was a member of the Human Genome Project.

GUY RAZ, HOST:

It's the TED Radio Hour from NPR. I'm Guy Raz. And today's show is all about predictions, connecting the dots from everything we see around us today to what we might actually have in the future.

(SOUNDBITE OF TED TALK)

RICHARD RESNICK: Ladies and gentlemen, I present to you the human genome.

(APPLAUSE)

RAZ: This is Richard Resnick on the TED stage. He runs a genetic software company. And behind him on the stage, a picture of 46 chromosomes.

(SOUNDBITE OF TED TALK)

RESNICK: If you zoom in on this genome, what you see, of course, is this double helix structure. The code of life spelled out with these four biochemical letters or we call them bases, right. A, C, G and T. How many are there in the human genome? Three billion. And, perhaps because of its
size, a group of people - all, by the way, with Y chromosomes - decided that they would want to sequence it.

RAZ: Which they did, an amazing scientific feat. They mapped the code that makes up all human DNA. Now they're still trying to figure out what it means, but they already know what it could mean for the future.

(SOUNDBITE OF TED TALK)

RESNICK: The world has completely changed and none of you know about it.

RAZ: So how is it going to change the world?

RESNICK: In a bunch of ways. The good news is it's going to help us immensely in treating cancer 'cause cancer is nothing more than a disease of the genome. It's a disease where one cell has certain changes, which cause it to get a little bit worse and then it reproduces. And by the time you've got a solid tumor, you've got this really heterogeneous population of cancerous cells. And if you sequence their genomes, they're a mess. And so right now, prior to genome sequencing, we're taking wild guesses at what the molecular basis of one's cancer is. And now going forward, what we're going to do is say, forget all of that, what is happening at the molecular level because this drug can target only those cancers that have the BRAF mutation, as an example.

RAZ: So where is it headed? What can you imagine in 10 or 20 years or beyond?

RESNICK: I think we will cure cancer. Genomics and sequencing at large will ultimately cure cancer. Whether that happens in 10 years or 50 years or more is difficult to say.

RAZ: That's incredible. I mean, you can say that with total confidence?

RESNICK: Absolutely. At some point, we'll snuff it out. I mean, people will still develop cancer, certainly, unless we get into genetic engineering of humans, which is something we ought to talk about, but it will be curable.

RAZ: So what about other diseases? I mean, could you detect those by sequencing genes?

RESNICK: Oh, that's not distant future. That's happening right now.

(SOUNDBITE OF TED TALK)

RESNICK: So here's little Nick. Nick shows up at the children's hospital with this distended belly like a famine victim, and it's not that he's not eating. It's that when he eats, his intestine basically opens up and feces spill out into his gut. So a hundred surgeries later, right, he looks at his mom and says, Mom, please pray for me. I'm in so much pain. His pediatrician happens to have a background in clinical genetics and he has no idea what's going on, but he says let's get
this kid's genome sequenced. And what they find is a single-point mutation in a gene responsible for controlling programmed cell death. So the theory is that he's having some immunological reaction to what's going on to the food, essentially, right. And so this informs, among other things, of course, a treatment for bone marrow transplant, which he undertakes. And after nine months of grueling recovery, he's now eating steak with A.1. sauce. The prospect of using the genome as a universal diagnostic is upon us today. It's here. And what it means for all of us is that everybody in this room could live an extra 5, 10, 20 years just because of this one thing.

RAZ: So walk us, like, 10 years from now or 20 years from now. You go into your doctor's office and something's wrong. I mean, this is going to be a normal part of seeing the doctor in the future?

RESNICK: Oh, yeah. Absolutely. There's a new company called Oxford Nanopore now that has one of these sequencing machines. Instead of it taking up a whole room and costing $500,000, it's the size of an iPhone. And so it'll be so cheap to do this that it will become, you know, trivial, why wouldn't we just have a look? And I think if you come to the hospital and you're sick, somebody's going to be looking at DNA.

RAZ: How fast is this happening?

RESNICK: Faster than we can keep up with. You know, every week, there's a new company, there's a new test, there's a new competitor trying to create space in this industry for genetic testing.

(SOUNDBITE OF TED TALK)

RESNICK: Consumer applications for genomics, they will flourish. Want to see whether you're genetically compatible with your girlfriend? Sure. DNA sequencing on your iPhone. There's an app for that. Personalized genomic massage, anyone? There's already a lab today that tests for allele 334 of the AVPR1 gene, the so-called cheating gene. So anybody whose here today with your significant other, just turn over to them and swab their mouth, send it to the lab and you'll know for sure. Do you really want to elect a president whose genome suggests cardiomyopathy? Now think of it. It's 2016, and the leading candidate releases not only her four years of back tax returns, but also her personal genome.

And it looks really good and then she challenges all of her competitors to do the same. Do you think that's not going to happen? You think it would have helped John McCain? My father's father is one of ten Resnick brothers. They all hated each other, right. And they all moved to different parts of the planet, so it's likely that I'm related to every Resnick that I ever meet, but I don't know. So imagine if my genome were de-identified, sitting in software, right, and a third cousin's genome was also sitting there, and there was software that could compare these two and make these associations. Would you be willing to meet your third cousin? And if we both say yes, voila. Welcome to chromosomally LinkedIn, right.
RAZ: This is amazing, but I mean, it's also a little bit scary.

RESNICK: Yeah, very scary. What we've discovered recently is that the entire genome of your baby in the mother's womb is circulating in the mother's blood. It's all there. With a simple blood draw, we can look at a baby's entire genome. So it's not so difficult to imagine looking at the same genes to try to understand whether your baby is going to have genes that are good for them. And so now you get into this very different world of designing babies by trial and error.

RAZ: Is that science fiction or do you think that that might be within the realm of human possibility?

RESNICK: No. It's technically possible right now. You could do that in a test tube. All the technology is available to do that today. It's up to us to as a society to figure out whether we want to have that happen. The knee-jerk is my, God, no. It's going to be Gattaca. It's going to be everything that we hate. But, you know, I mean, I'm a short, bald, Jewish guy with a bad back. If I could have had the choice to have genes that, you know, made my back not so painful and, you know, tall, with broad shoulders and long locks of hair well into my...

RAZ: Ryan Gosling body.

RESNICK: Right, you know. I mean, why wouldn't you choose that? And so it's time to answer the question. And I'm not taking a side on this question, but this is now a question that our society, in 2013, has to grapple with.

RAZ: How long before the moment a baby comes into the world - like, their genome is sequenced in the hospital and we'll be able to know everything about that baby, about what will happen to that baby, physically?

RESNICK: Less than 10 years. There's all sorts of discussions right now in the genetics community about, you know, sequencing babies upon birth and how that's going to affect health care in the future. The issue, of course, is sometimes you don't want to know. You don't want to know, and so how do you manage keeping that information in a place where the human can decide whether to look at it or not. There's - as soon as you get into this question of genetics and whether, you know, a genome should be sequenced, then all these ethical questions come out about what that means for the individual.

RAZ: Have you sequenced your own genome?

RESNICK: No.

RAZ: Why not?
RESNICK: Because I don't want to know. I don't want to - you know. I mean, if I were sick, I would do it for a diagnostic reason, but not for a prognostic reason. And that's the advice that I would give to anybody 'cause you may find a variant that suggests that you're going to get really sick with something terrible and it may never happen. And anyway, now that it's out there, there are times when certain agencies, like a life insurance, can have the right to look at that and make a guess. And in a world where every digital breadcrumb you leave behind can be tracked and looked at and watched, I would rather not have that information out there.

RAZ: If you had, you know, like, a crystal ball and you could ask it anything about the field of genetic testing, and you wanted to know something for sure, what would you ask it?

RESNICK: I guess I'd want to understand whether we're going to screw this one up, you know. I'd want to understand whether we can, in the 20, 50, 100-year future, whether we can wield this technology in a way that doesn't impinge upon people's basic human rights, but maximizes the benefits that could come from the technology.

So where are we? What happened? How did we do? Is cancer still around? Is malaria been wiped out? Are babies still made the way that they're made today? I'd love to see how it all works out.

RAZ: Richard Resnick. He runs a company called GenomeQuest, which makes genomic software. You can hear his entire talk at TED.com.

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