WEBVTT

NOTE duration: ”01:09:16.501”

NOTE Confidence: 0.94470215

00:00:00.560 --> 00:00:01.199 Welcome to,

NOTE Confidence: 0.93652344

00:00:02.000 --> 00:00:03.199 Grand Rounds for the Department

NOTE Confidence: 0.93652344

00:00:03.199 --> 00:00:03.780 of Pathology.

NOTE Confidence: 0.9327044

00:00:04.240 --> 00:00:05.600 Today, we have a very

NOTE Confidence: 0.9327044

00:00:05.600 --> 00:00:06.660 unusual speaker,

NOTE Confidence: 0.948291

00:00:07.040 --> 00:00:08.480 and then it's it's nearly

NOTE Confidence: 0.948291

00:00:08.480 --> 00:00:09.679 a childhood friend of mine,

NOTE Confidence: 0.948291

00:00:09.679 --> 00:00:11.280 but not exactly. We didn't

NOTE Confidence: 0.948291

00:00:11.280 --> 00:00:12.785 meet until college, And then

NOTE Confidence: 0.948291

00:00:12.785 --> 00:00:13.745 we helped each other get

NOTE Confidence: 0.948291

00:00:13.745 --> 00:00:15.365 to where we are now.

NOTE Confidence: 0.9486491

00:00:16.465 --> 00:00:17.345 And he was,

NOTE Confidence: 0.966875

00:00:17.905 --> 00:00:19.425 in the undergraduate program with

NOTE Confidence: 0.966875

00:00:19.425 --> 00:00:20.725 me at University of Wisconsin,

NOTE Confidence: 0.966875

00:00:20.945 --> 00:00:22.545 and we had probably eighty

NOTE Confidence: 0.966875

00:00:22.545 --> 00:00:23.665 percent of our classes were

NOTE Confidence: 0.966875

00:00:23.665 --> 00:00:25.605 the same. And then and,

NOTE Confidence: 0.9400775

00:00:26.020 --> 00:00:27.060 then he went off to

NOTE Confidence: 0.9400775

00:00:27.060 --> 00:00:28.100 do an MD PhD at

NOTE Confidence: 0.9400775

00:00:28.100 --> 00:00:29.060 WashU when I went off

NOTE Confidence: 0.9400775

00:00:29.060 --> 00:00:30.820 to Johns Hopkins. And we

NOTE Confidence: 0.9400775

00:00:30.820 --> 00:00:31.940 kinda kept in touch a

NOTE Confidence: 0.9400775

00:00:31.940 --> 00:00:33.380 little bit, and then he

NOTE Confidence: 0.9400775

00:00:33.380 --> 00:00:35.380 did, MD after his MD,

NOTE Confidence: 0.9400775

00:00:35.380 --> 00:00:37.060 he did laboratory medicine only,

NOTE Confidence: 0.9400775

00:00:37.060 --> 00:00:38.020 didn't do and I did

NOTE Confidence: 0.9400775

00:00:38.020 --> 00:00:39.620 AP only. So we're kinda

NOTE Confidence: 0.9400775

00:00:39.620 --> 00:00:41.295 little contradicting in that way

NOTE Confidence: 0.9400775

00:00:41.295 --> 00:00:42.675 as well. Yin and yang.

NOTE Confidence: 0.9400775

00:00:42.895 --> 00:00:43.395 Yeah.

NOTE Confidence: 0.970459

00:00:44.255 --> 00:00:44.735 And then,

NOTE Confidence: 0.95098203

00:00:45.455 --> 00:00:47.135 after that, he became faculty

NOTE Confidence: 0.95098203

00:00:47.135 --> 00:00:48.415 at WashU for a couple

NOTE Confidence: 0.95098203

00:00:48.415 --> 00:00:49.375 years, and then he moved

NOTE Confidence: 0.95098203

00:00:49.375 --> 00:00:50.415 to the NIH, and that's

NOTE Confidence: 0.95098203

00:00:50.415 --> 00:00:51.455 the story he's gonna tell

NOTE Confidence: 0.95098203

00:00:51.455 --> 00:00:53.150 you about today along with,

NOTE Confidence: 0.95098203

00:00:53.550 --> 00:00:54.830 the whole world of genomics,

NOTE Confidence: 0.95098203

00:00:54.830 --> 00:00:56.270 which Eric is a main

NOTE Confidence: 0.95098203

00:00:56.270 --> 00:00:58.270 lead major leader in. So

NOTE Confidence: 0.95098203

00:00:58.270 --> 00:00:59.550 without further ado, we'll bring

NOTE Confidence: 0.95098203

00:00:59.550 --> 00:01:00.430 Eric up to tell you

NOTE Confidence: 0.95098203

00:01:00.430 --> 00:01:01.090 the story.

NOTE Confidence: 0.96584475

00:01:05.875 --> 00:01:07.795 Well, thanks, Dave. It's a

NOTE Confidence: 0.96584475

00:01:07.795 --> 00:01:09.235 pleasure to be here. I,

NOTE Confidence: 0.96584475

00:01:09.634 --> 00:01:11.555 I'm I'm I'm always delighted

NOTE Confidence: 0.96584475

00:01:11.555 --> 00:01:12.515 to see Dave. We we

NOTE Confidence: 0.96584475

00:01:12.515 --> 00:01:13.314 we catch up with each

NOTE Confidence: 0.96584475

00:01:13.314 --> 00:01:14.935 other every handful of years,

NOTE Confidence: 0.99316406

00:01:15.555 --> 00:01:16.055 and,

NOTE Confidence: 0.98881197

00:01:16.515 --> 00:01:17.715 like you said, we started

NOTE Confidence: 0.98881197

00:01:17.715 --> 00:01:18.515 to know each other a

NOTE Confidence: 0.98881197

00:01:18.515 --> 00:01:19.555 lot by sharing a lot

NOTE Confidence: 0.98881197

00:01:19.555 --> 00:01:20.595 of classes and having a

NOTE Confidence: 0.98881197

00:01:20.595 --> 00:01:22.290 similar professional journey.

NOTE Confidence: 0.97769773

00:01:23.310 --> 00:01:24.750 And, it's always great to

NOTE Confidence: 0.97769773

00:01:24.750 --> 00:01:25.709 see him, but it's also

NOTE Confidence: 0.97769773

00:01:25.709 --> 00:01:27.230 always, this is, I think,

NOTE Confidence: 0.97769773

00:01:27.470 --> 00:01:28.850 my second or third time,

NOTE Confidence: 0.9660708

00:01:29.230 --> 00:01:30.590 coming to to Yale. Actually,

NOTE Confidence: 0.9660708

00:01:30.590 --> 00:01:31.790 I couldn't I didn't remember

NOTE Confidence: 0.9660708

00:01:31.790 --> 00:01:32.910 exactly the year, and I

NOTE Confidence: 0.9660708

00:01:32.910 --> 00:01:33.870 didn't have chance to look

NOTE Confidence: 0.9660708

00:01:33.870 --> 00:01:34.825 it up. But the last

NOTE Confidence: 0.9660708

00:01:34.825 --> 00:01:35.625 time I was here was

NOTE Confidence: 0.9660708

00:01:35.625 --> 00:01:37.145 also for for pathology lecture.

NOTE Confidence: 0.9660708

00:01:37.145 --> 00:01:38.605 I gave the Don King

NOTE Confidence: 0.9660708

00:01:38.825 --> 00:01:39.625 lecture, and I think it

NOTE Confidence: 0.9660708

00:01:39.625 --> 00:01:40.585 was maybe about ten years

NOTE Confidence: 0.9660708

00:01:40.585 --> 00:01:41.705 ago or twelve years ago,

NOTE Confidence: 0.9660708

00:01:41.705 --> 00:01:42.685 something like that.

NOTE Confidence: 0.96364874

00:01:43.385 --> 00:01:44.985 But, it is going to

NOTE Confidence: 0.96364874

00:01:44.985 --> 00:01:46.345 be an unusual talk. This

NOTE Confidence: 0.96364874

00:01:46.345 --> 00:01:47.400 is probably I guarantee you

NOTE Confidence: 0.96364874

00:01:47.400 --> 00:01:48.380 it's not a traditional,

NOTE Confidence: 0.8175049

00:01:49.240 --> 00:01:50.060 grand rounds.

NOTE Confidence: 0.9975315

00:01:50.600 --> 00:01:51.640 But I am here to

NOTE Confidence: 0.9975315

00:01:51.640 --> 00:01:53.180 really tell you about,

NOTE Confidence: 0.96097237

00:01:53.640 --> 00:01:55.320 a story, a journey, if

NOTE Confidence: 0.96097237

00:01:55.320 --> 00:01:55.900 you will,

NOTE Confidence: 0.9319662

00:01:56.200 --> 00:01:57.100 about genomics.

NOTE Confidence: 0.93168944

00:01:58.040 --> 00:01:59.980 One that you'll see has,

NOTE Confidence: 0.9509522

00:02:00.360 --> 00:02:02.015 elements that are scientific, some

NOTE Confidence: 0.9509522

00:02:02.015 --> 00:02:03.475 are medical, some are societal.

NOTE Confidence: 0.978163

00:02:03.775 --> 00:02:06.015 It's also completely intertwined with

NOTE Confidence: 0.978163

00:02:06.015 --> 00:02:07.875 my, my professional life.

NOTE Confidence: 0.9993164

00:02:08.334 --> 00:02:09.794 And so I will anecdotally

NOTE Confidence: 0.9943472

00:02:10.255 --> 00:02:11.294 explain to you how I've

NOTE Confidence: 0.9943472

00:02:11.294 --> 00:02:12.975 been woven into this, for

NOTE Confidence: 0.9943472

00:02:12.975 --> 00:02:14.435 now, multiple decades.

NOTE Confidence: 0.9816081

00:02:14.760 --> 00:02:15.960 The other thing I really

NOTE Confidence: 0.9816081

00:02:15.960 --> 00:02:16.460 enjoy,

NOTE Confidence: 0.95092773

00:02:16.760 --> 00:02:18.120 really enjoy about talks like

NOTE Confidence: 0.95092773

00:02:18.120 --> 00:02:19.080 this, and I'm looking out

NOTE Confidence: 0.95092773

00:02:19.080 --> 00:02:19.820 of the audience,

NOTE Confidence: 0.96461886

00:02:20.200 --> 00:02:21.960 is that it's really fun

NOTE Confidence: 0.96461886

00:02:21.960 --> 00:02:23.000 to tell the story I'm

NOTE Confidence: 0.96461886

00:02:23.000 --> 00:02:24.120 about to tell you to

NOTE Confidence: 0.96461886

00:02:24.120 --> 00:02:26.200 heterogeneous audiences. And in particularly

NOTE Confidence: 0.96461886

00:02:26.200 --> 00:02:28.125 heterogeneous with respect to age,

NOTE Confidence: 0.96461886

00:02:28.285 --> 00:02:29.085 And I'm not gonna call

NOTE Confidence: 0.96461886

00:02:29.085 --> 00:02:30.285 anyone out, but I always

NOTE Confidence: 0.96461886

00:02:30.285 --> 00:02:31.565 like when I can give

NOTE Confidence: 0.96461886

00:02:31.565 --> 00:02:33.245 talks that include people that

NOTE Confidence: 0.96461886

00:02:33.245 --> 00:02:34.445 are like Dave's and my

NOTE Confidence: 0.96461886

00:02:34.445 --> 00:02:35.885 age, and then people that

NOTE Confidence: 0.96461886

00:02:35.885 --> 00:02:37.325 are somewhat younger. And then

NOTE Confidence: 0.96461886

00:02:37.325 --> 00:02:38.525 in particular, when I see

NOTE Confidence: 0.96461886

00:02:38.525 --> 00:02:40.285 young trainees here as well.

NOTE Confidence: 0.96461886

00:02:40.285 --> 00:02:41.900 Because for some of us,

NOTE Confidence: 0.96461886

00:02:41.900 --> 00:02:42.860 it's gonna be a walk

NOTE Confidence: 0.96461886

00:02:42.860 --> 00:02:44.780 down memory lane, and for

NOTE Confidence: 0.96461886

00:02:44.780 --> 00:02:46.380 others of you, it's gonna

NOTE Confidence: 0.96461886

00:02:46.380 --> 00:02:47.660 be a history lesson. And

NOTE Confidence: 0.96461886

00:02:47.660 --> 00:02:48.780 so it is a challenge

NOTE Confidence: 0.96461886

00:02:48.780 --> 00:02:50.220 to prepare a talk like

NOTE Confidence: 0.96461886

00:02:50.220 --> 00:02:51.580 this because it means you

NOTE Confidence: 0.96461886

00:02:51.580 --> 00:02:53.120 really have to have

NOTE Confidence: 1

00:02:53.445 --> 00:02:54.745 pieces of your story

NOTE Confidence: 0.993571

00:02:55.044 --> 00:02:55.945 that are interesting,

NOTE Confidence: 0.9987793

00:02:56.565 --> 00:02:57.845 to all members of the

NOTE Confidence: 0.9987793

00:02:57.845 --> 00:02:58.345 audience.

NOTE Confidence: 0.993103

00:02:59.445 --> 00:03:01.065 And, so some people

NOTE Confidence: 0.94966054

00:03:01.365 --> 00:03:02.725 have told me that my

NOTE Confidence: 0.94966054

00:03:02.725 --> 00:03:04.665 talks tend to remind them

NOTE Confidence: 0.94966054

00:03:04.805 --> 00:03:06.965 of, Pixar movies where you

NOTE Confidence: 0.94966054

00:03:06.965 --> 00:03:08.500 have to have something for

NOTE Confidence: 0.94966054

00:03:08.500 --> 00:03:09.860 everybody. Otherwise, the parents don't

NOTE Confidence: 0.94966054

00:03:09.860 --> 00:03:10.580 really wanna watch it and

NOTE Confidence: 0.94966054

00:03:10.580 --> 00:03:11.220 the kids love it. You

NOTE Confidence: 0.94966054

00:03:11.220 --> 00:03:12.020 have to have something that

NOTE Confidence: 0.94966054

00:03:12.020 --> 00:03:13.780 entertains everybody. And so it

NOTE Confidence: 0.94966054

00:03:13.780 --> 00:03:14.820 really is true. And I

NOTE Confidence: 0.94966054

00:03:15.139 --> 00:03:16.500 my talk will follow some

NOTE Confidence: 0.94966054

00:03:16.500 --> 00:03:18.580 very prominent Pixar movies such

NOTE Confidence: 0.94966054

00:03:18.580 --> 00:03:19.880 as Genome Story,

NOTE Confidence: 0.93426704

00:03:20.325 --> 00:03:22.005 Finding Genome, and my personal

NOTE Confidence: 0.93426704

00:03:22.005 --> 00:03:24.325 favorite, genomes dot inc. So

NOTE Confidence: 0.93426704

00:03:24.325 --> 00:03:25.685 hopefully, I will live up

NOTE Confidence: 0.93426704

00:03:25.685 --> 00:03:26.805 to this by the end

NOTE Confidence: 0.93426704

00:03:26.805 --> 00:03:27.545 and hopefully,

NOTE Confidence: 0.9828491

00:03:27.925 --> 00:03:28.885 you will agree that there's

NOTE Confidence: 0.9828491

00:03:28.885 --> 00:03:29.845 a little bit of something

NOTE Confidence: 0.9828491

00:03:29.845 --> 00:03:30.505 for everybody.

NOTE Confidence: 0.97769445

00:03:30.965 --> 00:03:32.725 The other reason it's getting

NOTE Confidence: 0.97769445

00:03:32.725 --> 00:03:34.325 even more fun now for

NOTE Confidence: 0.97769445

00:03:34.325 --> 00:03:35.445 me to tell stories the

NOTE Confidence: 0.97769445

00:03:35.445 --> 00:03:36.380 way I'm gonna tell the

NOTE Confidence: 0.97769445

00:03:36.380 --> 00:03:36.959 story is

NOTE Confidence: 0.95880127

00:03:37.980 --> 00:03:40.160 because I've been able to

NOTE Confidence: 0.95880127

00:03:40.220 --> 00:03:42.239 exist, not totally by choice,

NOTE Confidence: 0.9717407

00:03:42.540 --> 00:03:43.920 but mostly by choice,

NOTE Confidence: 0.983846

00:03:44.459 --> 00:03:46.300 in really three different and

NOTE Confidence: 0.983846

00:03:46.300 --> 00:03:47.900 major major parts of the

NOTE Confidence: 0.983846

00:03:47.900 --> 00:03:49.040 biomedical ecosystem.

NOTE Confidence: 0.98913574

00:03:49.674 --> 00:03:50.795 So as you heard,

NOTE Confidence: 0.88871044

00:03:51.194 --> 00:03:52.875 after being an undergraduate with

NOTE Confidence: 0.88871044

00:03:52.875 --> 00:03:54.394 Dave University of Wisconsin, I

NOTE Confidence: 0.88871044

00:03:54.394 --> 00:03:55.355 went into the MD PhD

NOTE Confidence: 0.88871044

00:03:55.355 --> 00:03:56.655 program at Washington University.

NOTE Confidence: 0.9692383

00:03:57.034 --> 00:03:58.075 In nineteen eighty seven, I

NOTE Confidence: 0.9692383

00:03:58.075 --> 00:04:00.015 graduated. That's my graduation picture.

NOTE Confidence: 0.9925537

00:04:00.394 --> 00:04:01.595 But that's about the halfway

NOTE Confidence: 0.9925537

00:04:01.595 --> 00:04:02.795 point of my thirteen years

NOTE Confidence: 0.9925537

00:04:02.795 --> 00:04:04.075 there. I then trained in

NOTE Confidence: 0.9925537

00:04:04.075 --> 00:04:04.575 pathology.

NOTE Confidence: 0.97935265

00:04:05.060 --> 00:04:05.700 By the way, we will

NOTE Confidence: 0.97935265

00:04:05.700 --> 00:04:06.580 come back to the year

NOTE Confidence: 0.97935265

00:04:06.580 --> 00:04:07.620 nineteen eighty seven in a

NOTE Confidence: 0.97935265

00:04:07.620 --> 00:04:09.700 minute. But but when I

NOTE Confidence: 0.97935265

00:04:09.700 --> 00:04:10.200 graduated

NOTE Confidence: 0.93485755

00:04:10.500 --> 00:04:11.780 there and I chose to

NOTE Confidence: 0.93485755

00:04:11.780 --> 00:04:13.299 stay there in part, because

NOTE Confidence: 0.93485755

00:04:13.299 --> 00:04:14.260 my wife was a medical

NOTE Confidence: 0.93485755

00:04:14.260 --> 00:04:15.080 student then,

NOTE Confidence: 0.9807129

00:04:15.459 --> 00:04:15.959 I,

NOTE Confidence: 0.9980469

00:04:16.419 --> 00:04:16.919 therefore

NOTE Confidence: 0.96699697

00:04:17.625 --> 00:04:19.065 trained in pathology, which or

NOTE Confidence: 0.96699697

00:04:19.065 --> 00:04:20.025 lab medicine, which gave me

NOTE Confidence: 0.96699697

00:04:20.025 --> 00:04:20.825 a chance to go back

NOTE Confidence: 0.96699697

00:04:20.825 --> 00:04:22.105 to the lab. That was

NOTE Confidence: 0.96699697

00:04:22.105 --> 00:04:23.705 at a critical juncture because

NOTE Confidence: 0.96699697

00:04:23.705 --> 00:04:24.825 it was right and especially

NOTE Confidence: 0.96699697

00:04:24.825 --> 00:04:26.425 at WashU because this new

NOTE Confidence: 0.96699697

00:04:26.425 --> 00:04:28.345 thing called genomics was pretty

NOTE Confidence: 0.96699697

00:04:28.345 --> 00:04:30.045 hot at WashU back then,

NOTE Confidence: 0.96699697

00:04:30.199 --> 00:04:31.080 and that's how I jumped

NOTE Confidence: 0.96699697

00:04:31.080 --> 00:04:32.360 into genomics as for the

NOTE Confidence: 0.96699697

00:04:32.360 --> 00:04:33.479 very first time as a

NOTE Confidence: 0.96699697

00:04:33.479 --> 00:04:33.979 postdoctoral

NOTE Confidence: 0.99560547

00:04:34.520 --> 00:04:35.020 fellow.

NOTE Confidence: 0.9704146

00:04:35.400 --> 00:04:36.440 And then I was fortunate

NOTE Confidence: 0.9704146

00:04:36.440 --> 00:04:37.320 enough to be get involved

NOTE Confidence: 0.9704146

00:04:37.320 --> 00:04:38.360 in the Human Genome Project

NOTE Confidence: 0.9704146

00:04:38.360 --> 00:04:39.960 literally on day one. And

NOTE Confidence: 0.9704146

00:04:39.960 --> 00:04:41.320 even as an assistant professor

NOTE Confidence: 0.9704146

00:04:41.320 --> 00:04:42.120 for two years, I was

NOTE Confidence: 0.9704146

00:04:42.120 --> 00:04:43.320 working on the Human Genome

NOTE Confidence: 0.9704146

00:04:43.320 --> 00:04:45.085 Project. But then an opportunity

NOTE Confidence: 0.9704146

00:04:45.145 --> 00:04:46.685 came when Francis Collins,

NOTE Confidence: 0.95863074

00:04:47.305 --> 00:04:48.765 recruited me to the National

NOTE Confidence: 0.95863074

00:04:48.825 --> 00:04:50.745 Institutes of Health, specifically to

NOTE Confidence: 0.95863074

00:04:50.745 --> 00:04:52.425 the Genome Institute, now called

NOTE Confidence: 0.95863074

00:04:52.425 --> 00:04:53.865 the National Human Genome Research

NOTE Confidence: 0.95863074

00:04:53.865 --> 00:04:55.645 Institute. That was the institute

NOTE Confidence: 0.95863074

00:04:55.705 --> 00:04:56.950 that was created by the

NOTE Confidence: 0.95863074

00:04:56.950 --> 00:04:58.470 US Congress to lead the

NOTE Confidence: 0.95863074

00:04:58.470 --> 00:04:59.589 US's effort in the Human

NOTE Confidence: 0.95863074

00:04:59.589 --> 00:05:01.750 Genome Project. And I and

NOTE Confidence: 0.95863074

00:05:01.750 --> 00:05:03.430 and and Francis became the

NOTE Confidence: 0.95863074

00:05:03.430 --> 00:05:05.210 second director after Jim Watson,

NOTE Confidence: 0.95863074

00:05:05.350 --> 00:05:06.390 and then he recruited me

NOTE Confidence: 0.95863074

00:05:06.390 --> 00:05:07.770 there as a junior investigator.

NOTE Confidence: 0.95863074

00:05:08.070 --> 00:05:09.110 And then over my thirty

NOTE Confidence: 0.95863074

00:05:09.110 --> 00:05:10.845 one years there, I accumulated

NOTE Confidence: 0.95863074

00:05:10.845 --> 00:05:12.925 various leadership positions. And then

NOTE Confidence: 0.95863074

00:05:12.925 --> 00:05:14.525 eventually, when Francis became the

NOTE Confidence: 0.95863074

00:05:14.525 --> 00:05:16.525 NIH director, I can I

NOTE Confidence: 0.95863074

00:05:16.525 --> 00:05:18.044 applied to become the Genome

NOTE Confidence: 0.95863074

00:05:18.044 --> 00:05:20.125 Institute director, which I got?

NOTE Confidence: 0.95863074

00:05:20.125 --> 00:05:21.164 And then for my last

NOTE Confidence: 0.95863074

00:05:21.164 --> 00:05:22.145 fifteen years

NOTE Confidence: 0.9503621

00:05:22.540 --> 00:05:23.980 at NHGRI, I was the

NOTE Confidence: 0.9503621

00:05:23.980 --> 00:05:25.180 institute director. Last time, I

NOTE Confidence: 0.9503621

00:05:25.180 --> 00:05:25.900 think, I was here, I

NOTE Confidence: 0.9503621

00:05:25.900 --> 00:05:27.760 was already the NHGRI director.

NOTE Confidence: 0.9450955

00:05:28.860 --> 00:05:30.800 I retired from federal service

NOTE Confidence: 0.9450955

00:05:31.100 --> 00:05:32.720 about thirteen months ago.

NOTE Confidence: 0.9792901

00:05:33.180 --> 00:05:34.860 It wasn't totally by choice.

NOTE Confidence: 0.9792901

00:05:34.860 --> 00:05:35.995 I won't go there. But

NOTE Confidence: 0.9792901

00:05:35.995 --> 00:05:37.035 let's just say I was

NOTE Confidence: 0.9792901

00:05:37.035 --> 00:05:38.875 retirement eligible, and so I

NOTE Confidence: 0.9792901

00:05:38.875 --> 00:05:41.115 retired from federal service with

NOTE Confidence: 0.9792901

00:05:41.115 --> 00:05:42.895 zero intention of retiring.

NOTE Confidence: 0.9986708

00:05:43.755 --> 00:05:45.755 And, and after looking and

NOTE Confidence: 0.9986708

00:05:45.755 --> 00:05:47.755 exploring options for this next

NOTE Confidence: 0.9986708

00:05:47.755 --> 00:05:49.035 stage of my career, I

NOTE Confidence: 0.9986708

00:05:49.035 --> 00:05:50.095 was very fortunate

NOTE Confidence: 0.9885254

00:05:50.400 --> 00:05:50.800 that,

NOTE Confidence: 0.94787043

00:05:51.200 --> 00:05:52.640 eighty seven days ago, and

NOTE Confidence: 0.94787043

00:05:52.640 --> 00:05:53.680 when I was still counting

NOTE Confidence: 0.94787043

00:05:53.680 --> 00:05:55.120 days, I went into the

NOTE Confidence: 0.94787043

00:05:55.120 --> 00:05:56.480 private sector. So I started

NOTE Confidence: 0.94787043

00:05:56.480 --> 00:05:57.140 in academia,

NOTE Confidence: 0.97139245

00:05:57.600 --> 00:05:58.640 then the public sector and

NOTE Confidence: 0.97139245

00:05:58.640 --> 00:05:59.520 the government, and now I'm

NOTE Confidence: 0.97139245

00:05:59.520 --> 00:06:00.560 in the private sector where

NOTE Confidence: 0.97139245

00:06:00.560 --> 00:06:01.520 I am the chief medical

NOTE Confidence: 0.97139245

00:06:01.520 --> 00:06:02.960 officer for a company that

NOTE Confidence: 0.97139245

00:06:02.960 --> 00:06:03.920 probably many of you have

NOTE Confidence: 0.97139245

00:06:03.920 --> 00:06:04.900 heard of called Illumina.

NOTE Confidence: 0.9528198

00:06:05.475 --> 00:06:06.514 And I'm in by eighty

NOTE Confidence: 0.9528198

00:06:06.514 --> 00:06:07.714 seventh day. So you can

NOTE Confidence: 0.9528198

00:06:07.714 --> 00:06:09.074 see there's an imbalance of

NOTE Confidence: 0.9528198

00:06:09.074 --> 00:06:10.695 time across these three domains,

NOTE Confidence: 0.9528198

00:06:10.835 --> 00:06:11.714 but I've learned a lot

NOTE Confidence: 0.9528198

00:06:11.714 --> 00:06:12.595 of my first eighty but

NOTE Confidence: 0.9528198

00:06:12.595 --> 00:06:13.495 I bring a perspective

NOTE Confidence: 0.9851532

00:06:13.875 --> 00:06:15.475 of someone who's lived in

NOTE Confidence: 0.9851532

00:06:15.475 --> 00:06:17.074 three places, although only eighty

NOTE Confidence: 0.9851532

00:06:17.074 --> 00:06:18.195 seven days in the private

NOTE Confidence: 0.9851532

00:06:18.195 --> 00:06:18.695 sector.

NOTE Confidence: 0.94304746

00:06:19.110 --> 00:06:20.229 One of the things that's

NOTE Confidence: 0.94304746

00:06:20.229 --> 00:06:21.669 really cool though about being

NOTE Confidence: 0.94304746

00:06:21.669 --> 00:06:22.330 at Illumina,

NOTE Confidence: 0.9662301

00:06:22.710 --> 00:06:24.229 because especially in my thirty

NOTE Confidence: 0.9662301

00:06:24.229 --> 00:06:25.350 one years in the federal

NOTE Confidence: 0.9662301

00:06:25.350 --> 00:06:26.949 government is when you're in

NOTE Confidence: 0.9662301

00:06:26.949 --> 00:06:28.790 the federal government, especially when

NOTE Confidence: 0.9662301

00:06:28.790 --> 00:06:29.910 you're in a leadership position,

NOTE Confidence: 0.9662301

00:06:29.910 --> 00:06:30.889 you are overwhelmingly

NOTE Confidence: 0.9922135

00:06:31.190 --> 00:06:32.955 boring because of ethics rules

NOTE Confidence: 0.9922135

00:06:32.955 --> 00:06:33.835 that don't allow you to

NOTE Confidence: 0.9922135

00:06:33.835 --> 00:06:35.915 do anything worth disclosing. But

NOTE Confidence: 0.9922135

00:06:35.915 --> 00:06:37.275 now at Illumina, I get

NOTE Confidence: 0.9922135

00:06:37.275 --> 00:06:38.635 to actually use a disclosure

NOTE Confidence: 0.9922135

00:06:38.635 --> 00:06:39.755 slide, which I've never been

NOTE Confidence: 0.9922135

00:06:39.755 --> 00:06:40.795 able to do except for

NOTE Confidence: 0.9922135

00:06:40.795 --> 00:06:42.475 eighty seven days ago. So

NOTE Confidence: 0.9922135

00:06:42.475 --> 00:06:43.915 I have to disclose this,

NOTE Confidence: 0.9922135

00:06:43.915 --> 00:06:45.115 and I'm so excited that

NOTE Confidence: 0.9922135

00:06:45.115 --> 00:06:45.915 I get to add a

NOTE Confidence: 0.9922135

00:06:45.915 --> 00:06:47.220 slide to my slide deck.

NOTE Confidence: 0.9922135

00:06:47.380 --> 00:06:48.180 So that's been one of

NOTE Confidence: 0.9922135

00:06:48.180 --> 00:06:49.480 the fun learning experiences.

NOTE Confidence: 0.9975586

00:06:50.740 --> 00:06:52.020 So I bring to this

NOTE Confidence: 0.9975586

00:06:52.020 --> 00:06:52.520 storytelling

NOTE Confidence: 0.9494629

00:06:52.980 --> 00:06:53.480 talk,

NOTE Confidence: 0.98051757

00:06:54.100 --> 00:06:56.040 basically, a very broad perspective

NOTE Confidence: 0.9807445

00:06:56.420 --> 00:06:58.020 of someone who got involved

NOTE Confidence: 0.9807445

00:06:58.020 --> 00:06:59.460 in genomics at its inception.

NOTE Confidence: 0.9807445

00:06:59.460 --> 00:07:00.420 But I actually wanna take

NOTE Confidence: 0.9807445

00:07:00.420 --> 00:07:01.460 a step back and set

NOTE Confidence: 0.9807445

00:07:01.460 --> 00:07:02.865 a broader context for you.

NOTE Confidence: 0.9807445

00:07:03.025 --> 00:07:03.904 I'm gonna make the claim

NOTE Confidence: 0.9807445

00:07:03.904 --> 00:07:04.785 that it's so fun to

NOTE Confidence: 0.9807445

00:07:04.785 --> 00:07:05.505 talk to a group of

NOTE Confidence: 0.9807445

00:07:05.505 --> 00:07:07.185 pathologists because you're so much

NOTE Confidence: 0.9807445

00:07:07.185 --> 00:07:08.645 in the crosshairs of this

NOTE Confidence: 0.9807445

00:07:08.865 --> 00:07:10.384 revolution or this transition or

NOTE Confidence: 0.9807445

00:07:10.384 --> 00:07:11.905 this transformation, whatever word you

NOTE Confidence: 0.9807445

00:07:11.905 --> 00:07:13.505 wanna use. I'm gonna contend

NOTE Confidence: 0.9807445

00:07:13.505 --> 00:07:14.724 that there are two interrelated

NOTE Confidence: 0.9807445

00:07:14.944 --> 00:07:16.085 scientific fields,

NOTE Confidence: 0.9801636

00:07:16.410 --> 00:07:17.810 both launched last century, that

NOTE Confidence: 0.9801636

00:07:17.810 --> 00:07:19.130 I think are changing medicine

NOTE Confidence: 0.9801636

00:07:19.130 --> 00:07:19.870 this century.

NOTE Confidence: 0.9940864

00:07:20.410 --> 00:07:21.530 The first of which is

NOTE Confidence: 0.9940864

00:07:21.530 --> 00:07:22.670 this field of genetics,

NOTE Confidence: 0.9719144

00:07:23.050 --> 00:07:24.810 by the way, which didn't

NOTE Confidence: 0.9719144

00:07:24.810 --> 00:07:26.090 exist as a word until

NOTE Confidence: 0.9719144

00:07:26.090 --> 00:07:27.770 nineteen o seven, wasn't appearing

NOTE Confidence: 0.9719144

00:07:27.930 --> 00:07:28.970 the word never appeared in

NOTE Confidence: 0.9719144

00:07:28.970 --> 00:07:30.715 the scientific press until this

NOTE Confidence: 0.9719144

00:07:30.715 --> 00:07:31.215 publication

NOTE Confidence: 0.92027867

00:07:31.675 --> 00:07:32.875 in nineteen o seven. And

NOTE Confidence: 0.92027867

00:07:32.875 --> 00:07:34.155 of course, genetics is the

NOTE Confidence: 0.92027867

00:07:34.155 --> 00:07:35.055 study of inheritance.

NOTE Confidence: 0.95308024

00:07:35.835 --> 00:07:38.095 And the word was invented

NOTE Confidence: 0.95308024

00:07:38.155 --> 00:07:39.275 before we even know what

NOTE Confidence: 0.95308024

00:07:39.275 --> 00:07:40.875 the information of inher molecule

NOTE Confidence: 0.95308024

00:07:40.875 --> 00:07:42.315 of inheritance was, of course,

NOTE Confidence: 0.95308024

00:07:42.315 --> 00:07:43.835 DNA, but they knew there

NOTE Confidence: 0.95308024

00:07:43.835 --> 00:07:45.295 was things that were transmitted

NOTE Confidence: 1

00:07:45.820 --> 00:07:46.320 through

NOTE Confidence: 0.76920575

00:07:46.780 --> 00:07:48.240 the inheritance process.

NOTE Confidence: 0.952614

00:07:48.780 --> 00:07:50.620 Well, things happened after nineteen

NOTE Confidence: 0.952614

00:07:50.620 --> 00:07:52.060 o seven, eventually figured out

NOTE Confidence: 0.952614

00:07:52.060 --> 00:07:53.180 that not we. I wasn't

NOTE Confidence: 0.952614

00:07:53.180 --> 00:07:55.100 alive. Others figured out that

NOTE Confidence: 0.952614

00:07:55.100 --> 00:07:56.300 DNA was the molecule of

NOTE Confidence: 0.952614

00:07:56.300 --> 00:07:57.580 heredity. A lot of attention

NOTE Confidence: 0.952614

00:07:57.580 --> 00:07:58.780 went to DNA, and at

NOTE Confidence: 0.952614

00:07:58.780 --> 00:08:00.764 halftime of last century came

NOTE Confidence: 0.952614

00:08:00.764 --> 00:08:01.985 that famous discovery,

NOTE Confidence: 0.99902344

00:08:02.845 --> 00:08:04.365 of the double helical structure

NOTE Confidence: 0.99902344

00:08:04.365 --> 00:08:05.104 of DNA,

NOTE Confidence: 0.99960935

00:08:05.645 --> 00:08:07.185 which gave a key insight

NOTE Confidence: 0.98156226

00:08:07.565 --> 00:08:08.525 about how it was that

NOTE Confidence: 0.98156226

00:08:08.525 --> 00:08:10.305 DNA was the information molecule.

NOTE Confidence: 0.98156226

00:08:10.445 --> 00:08:11.805 And then a lot happened

NOTE Confidence: 0.98156226

00:08:11.805 --> 00:08:13.324 between the fifties and the

NOTE Confidence: 0.98156226

00:08:13.324 --> 00:08:15.070 sixties and the seventies and

NOTE Confidence: 0.98156226

00:08:15.070 --> 00:08:17.010 the eighties that then led

NOTE Confidence: 0.98156226

00:08:17.150 --> 00:08:18.430 to the coining of a

NOTE Confidence: 0.98156226

00:08:18.430 --> 00:08:20.830 new word, genomics, genome being

NOTE Confidence: 0.98156226

00:08:20.830 --> 00:08:21.710 all the DNA of an

NOTE Confidence: 0.98156226

00:08:21.710 --> 00:08:23.390 organism, and the launching of

NOTE Confidence: 0.98156226

00:08:23.390 --> 00:08:24.690 a new field of genomics,

NOTE Confidence: 0.98384094

00:08:25.230 --> 00:08:26.910 which happened in nineteen eighty

NOTE Confidence: 0.98384094

00:08:26.910 --> 00:08:28.110 seven. And I told you,

NOTE Confidence: 0.98384094

00:08:28.110 --> 00:08:28.990 that was the year I

NOTE Confidence: 0.98384094

00:08:28.990 --> 00:08:29.490 graduated

NOTE Confidence: 0.95150644

00:08:30.315 --> 00:08:31.514 medical school and graduate school,

NOTE Confidence: 0.95150644

00:08:31.514 --> 00:08:32.714 which means never once as

NOTE Confidence: 0.95150644

00:08:32.714 --> 00:08:33.795 an MD PhD student did

NOTE Confidence: 0.95150644

00:08:33.795 --> 00:08:34.795 I hear the word genomics

NOTE Confidence: 0.95150644

00:08:34.795 --> 00:08:36.315 because it didn't exist until

NOTE Confidence: 0.95150644

00:08:36.315 --> 00:08:37.054 eighty seven.

NOTE Confidence: 0.9854841

00:08:37.915 --> 00:08:39.115 And, of course, all of

NOTE Confidence: 0.9854841

00:08:39.115 --> 00:08:40.635 this was being discussed because

NOTE Confidence: 0.9854841

00:08:40.635 --> 00:08:41.995 of this idea that the

NOTE Confidence: 0.9854841

00:08:41.995 --> 00:08:43.515 tools for studying DNA were

NOTE Confidence: 0.9854841

00:08:43.515 --> 00:08:45.570 getting so so good. And

NOTE Confidence: 0.9854841

00:08:45.570 --> 00:08:47.090 that's really what made this

NOTE Confidence: 0.9854841

00:08:47.090 --> 00:08:49.590 progression happen was technological innovation

NOTE Confidence: 0.95188993

00:08:50.050 --> 00:08:52.050 be between when we discovered

NOTE Confidence: 0.95188993

00:08:52.050 --> 00:08:53.410 the double helical structure of

NOTE Confidence: 0.95188993

00:08:53.410 --> 00:08:54.850 DNA that led to the

NOTE Confidence: 0.95188993

00:08:54.850 --> 00:08:55.970 recognition that we needed a

NOTE Confidence: 0.95188993

00:08:55.970 --> 00:08:56.930 whole new discipline or at

NOTE Confidence: 0.95188993

00:08:56.930 --> 00:08:57.650 least the name of a

NOTE Confidence: 0.95188993

00:08:57.650 --> 00:08:59.350 discipline. And that progression

NOTE Confidence: 0.97314453

00:08:59.925 --> 00:09:01.865 really does reflect technical innovation.

NOTE Confidence: 0.99938965

00:09:02.245 --> 00:09:03.285 And it was a series

NOTE Confidence: 0.99938965

00:09:03.285 --> 00:09:04.505 of important discoveries

NOTE Confidence: 0.9505406

00:09:04.965 --> 00:09:07.045 such as going from our,

NOTE Confidence: 0.9505406

00:09:07.605 --> 00:09:09.205 a complete lack of understanding

NOTE Confidence: 0.9505406

00:09:09.205 --> 00:09:09.925 of how it was that

NOTE Confidence: 0.9505406

00:09:09.925 --> 00:09:11.125 the four letters of DNA

NOTE Confidence: 0.9505406

00:09:11.125 --> 00:09:13.205 could encode biological information, actually

NOTE Confidence: 0.9505406

00:09:13.205 --> 00:09:14.790 figuring out the genetic code,

NOTE Confidence: 0.9505406

00:09:14.870 --> 00:09:15.750 which took place in the

NOTE Confidence: 0.9505406

00:09:15.750 --> 00:09:16.570 nineteen sixties.

NOTE Confidence: 0.969608

00:09:16.949 --> 00:09:17.990 Of course, then by the

NOTE Confidence: 0.969608

00:09:17.990 --> 00:09:19.509 nineteen seventies, when Dave and

NOTE Confidence: 0.969608

00:09:19.509 --> 00:09:21.350 I graduated high school, roughly

NOTE Confidence: 0.969608

00:09:21.350 --> 00:09:22.550 that time, was when the

NOTE Confidence: 0.969608

00:09:22.550 --> 00:09:24.389 first methods for sequencing DNA,

NOTE Confidence: 0.969608

00:09:24.389 --> 00:09:25.429 reading out the g's, a's,

NOTE Confidence: 0.969608

00:09:25.429 --> 00:09:27.130 t's, and c's were invented.

NOTE Confidence: 0.9629978

00:09:27.495 --> 00:09:28.455 But then, of course, the

NOTE Confidence: 0.9629978

00:09:28.455 --> 00:09:30.054 latter seventies and and into

NOTE Confidence: 0.9629978

00:09:30.054 --> 00:09:31.595 the eighties with the molecular

NOTE Confidence: 0.9629978

00:09:31.655 --> 00:09:33.735 biology revolution brought all the

NOTE Confidence: 0.9629978

00:09:33.735 --> 00:09:35.175 tools of molecular biology for

NOTE Confidence: 0.9629978

00:09:35.175 --> 00:09:37.495 cloning DNA, manipulating DNA, doing

NOTE Confidence: 0.9629978

00:09:37.495 --> 00:09:40.215 recombinant DNA, eventually inventing PCR

NOTE Confidence: 0.9629978

00:09:40.215 --> 00:09:41.735 for amplifying DNA and so

NOTE Confidence: 0.9629978

00:09:41.735 --> 00:09:42.235 forth.

NOTE Confidence: 0.9681478

00:09:42.980 --> 00:09:45.720 This created an increasingly powerful

NOTE Confidence: 0.9681478

00:09:45.779 --> 00:09:47.139 tool belt for those who

NOTE Confidence: 0.9681478

00:09:47.139 --> 00:09:48.920 are interested in studying DNA.

NOTE Confidence: 0.9814453

00:09:49.379 --> 00:09:50.660 And what that led to

NOTE Confidence: 0.9814453

00:09:50.660 --> 00:09:52.420 was the idea of could

NOTE Confidence: 0.9814453

00:09:52.420 --> 00:09:53.860 we, should we, might we

NOTE Confidence: 0.9814453

00:09:53.860 --> 00:09:55.059 be able to start to

NOTE Confidence: 0.9814453

00:09:55.059 --> 00:09:55.879 think comprehensively

NOTE Confidence: 0.88273114

00:09:56.500 --> 00:09:58.279 about organisms' DNA,

NOTE Confidence: 0.99645996

00:09:58.775 --> 00:09:59.915 all of their genome.

NOTE Confidence: 0.9934082

00:10:00.615 --> 00:10:01.655 So that led to a

NOTE Confidence: 0.9934082

00:10:01.655 --> 00:10:02.875 drumbeat of discussions

NOTE Confidence: 0.9426141

00:10:03.415 --> 00:10:04.615 that ended up leading to

NOTE Confidence: 0.9426141

00:10:04.615 --> 00:10:06.715 the human genome project. So,

NOTE Confidence: 0.9426141

00:10:06.934 --> 00:10:08.215 you know, the first as

NOTE Confidence: 0.9426141

00:10:08.215 --> 00:10:10.235 possible real serious discussion

NOTE Confidence: 0.96835494

00:10:10.615 --> 00:10:11.575 came about in a very

NOTE Confidence: 0.96835494

00:10:11.575 --> 00:10:12.775 famous meeting that took place

NOTE Confidence: 0.96835494

00:10:12.775 --> 00:10:14.319 in nineteen eighty four. It

NOTE Confidence: 0.96835494

00:10:14.319 --> 00:10:15.519 was called the Alta Summit

NOTE Confidence: 0.96835494

00:10:15.519 --> 00:10:16.639 where a group of scientists

NOTE Confidence: 0.96835494

00:10:16.639 --> 00:10:17.600 got together and for the

NOTE Confidence: 0.96835494

00:10:17.600 --> 00:10:19.199 very first time said, what

NOTE Confidence: 0.96835494

00:10:19.199 --> 00:10:20.240 might that look like if

NOTE Confidence: 0.96835494

00:10:20.240 --> 00:10:21.360 we were actually gonna map

NOTE Confidence: 0.96835494

00:10:21.360 --> 00:10:22.879 and sequence the human genome

NOTE Confidence: 0.96835494

00:10:22.879 --> 00:10:24.339 and maybe some other genomes?

NOTE Confidence: 0.9688179

00:10:25.519 --> 00:10:27.519 Then oops. Then nineteen eighty

NOTE Confidence: 0.9688179

00:10:27.519 --> 00:10:28.019 six,

NOTE Confidence: 0.8050537

00:10:28.495 --> 00:10:29.714 a prominent,

NOTE Confidence: 0.87854457

00:10:30.175 --> 00:10:32.194 cancer biologist, Renato Del Beco,

NOTE Confidence: 0.87854457

00:10:32.334 --> 00:10:33.634 wrote a very pivotal,

NOTE Confidence: 0.99902344

00:10:34.095 --> 00:10:35.235 editorial perspective

NOTE Confidence: 0.98986816

00:10:35.615 --> 00:10:36.654 where he talked about the

NOTE Confidence: 0.98986816

00:10:36.654 --> 00:10:37.615 fact that if we were

NOTE Confidence: 0.98986816

00:10:37.615 --> 00:10:39.554 ever gonna truly understand cancer,

NOTE Confidence: 0.98986816

00:10:39.615 --> 00:10:40.735 we needed to sequence the

NOTE Confidence: 0.98986816

00:10:40.735 --> 00:10:41.554 human genome.

NOTE Confidence: 0.9749603

00:10:42.089 --> 00:10:43.370 It was that kind of

NOTE Confidence: 0.9749603

00:10:43.370 --> 00:10:45.769 discussion and drum increasing drum

NOTE Confidence: 0.9749603

00:10:45.769 --> 00:10:47.290 beats that led to nineteen

NOTE Confidence: 0.9749603

00:10:47.290 --> 00:10:48.410 eighty seven, the launching of

NOTE Confidence: 0.9749603

00:10:48.410 --> 00:10:49.370 the field, the coining of

NOTE Confidence: 0.9749603

00:10:49.370 --> 00:10:50.490 the word, the first journal

NOTE Confidence: 0.9749603

00:10:50.490 --> 00:10:51.230 called Genomics.

NOTE Confidence: 0.9584961

00:10:51.769 --> 00:10:53.209 And then scientists got really

NOTE Confidence: 0.9584961

00:10:53.209 --> 00:10:54.730 serious because then they said,

NOTE Confidence: 0.9584961

00:10:54.730 --> 00:10:55.929 we really do think we

NOTE Confidence: 0.9584961

00:10:55.929 --> 00:10:57.915 wanna operationalize this. There were

NOTE Confidence: 0.9584961

00:10:57.915 --> 00:10:59.135 then two important

NOTE Confidence: 1

00:11:00.075 --> 00:11:00.575 studies

NOTE Confidence: 0.96374106

00:11:00.955 --> 00:11:02.475 that were conducted. One under

NOTE Confidence: 0.96374106

00:11:02.475 --> 00:11:03.835 the auspices of the National

NOTE Confidence: 0.96374106

00:11:03.835 --> 00:11:05.434 Research Council, one under the

NOTE Confidence: 0.96374106

00:11:05.434 --> 00:11:06.955 offices the auspices of the

NOTE Confidence: 0.96374106

00:11:06.955 --> 00:11:08.415 office of science and technology

NOTE Confidence: 0.96374106

00:11:08.554 --> 00:11:09.934 policy in the White House,

NOTE Confidence: 0.96374106

00:11:09.995 --> 00:11:11.355 both of which brought scientists

NOTE Confidence: 0.96374106

00:11:11.355 --> 00:11:12.940 together and fleshed out the

NOTE Confidence: 0.96374106

00:11:12.940 --> 00:11:14.140 idea of how we would

NOTE Confidence: 0.96374106

00:11:14.140 --> 00:11:15.920 go about mapping and sequencing

NOTE Confidence: 0.96374106

00:11:15.980 --> 00:11:17.179 the human genome, launching a

NOTE Confidence: 0.96374106

00:11:17.179 --> 00:11:18.220 big project like the Human

NOTE Confidence: 0.96374106

00:11:18.220 --> 00:11:19.760 Genome Project and so forth.

NOTE Confidence: 0.96374106

00:11:19.900 --> 00:11:22.240 Of course, that required funders

NOTE Confidence: 0.96374106

00:11:22.300 --> 00:11:23.740 around the world committing to

NOTE Confidence: 0.96374106

00:11:23.740 --> 00:11:24.860 actually having the money to

NOTE Confidence: 0.96374106

00:11:24.860 --> 00:11:25.905 actually do this and then

NOTE Confidence: 0.96374106

00:11:25.905 --> 00:11:27.565 organize it in some way.

NOTE Confidence: 0.96374106

00:11:27.704 --> 00:11:28.904 In the United States, the

NOTE Confidence: 0.96374106

00:11:28.904 --> 00:11:31.065 instrumental hearing took place in

NOTE Confidence: 0.96374106

00:11:31.065 --> 00:11:31.725 the senate

NOTE Confidence: 0.96742755

00:11:32.105 --> 00:11:33.545 at at a particular hearing

NOTE Confidence: 0.96742755

00:11:33.545 --> 00:11:34.745 that took place in nineteen

NOTE Confidence: 0.96742755

00:11:34.745 --> 00:11:35.404 eighty nine,

NOTE Confidence: 0.9596174

00:11:36.184 --> 00:11:38.684 presided, including senators like senator

NOTE Confidence: 0.9596174

00:11:38.825 --> 00:11:40.610 Al Gore and senator Ted

NOTE Confidence: 0.9596174

00:11:40.610 --> 00:11:42.390 Kennedy, who are big proponents

NOTE Confidence: 0.9596174

00:11:42.610 --> 00:11:43.890 of genomics and the Human

NOTE Confidence: 0.9596174

00:11:43.890 --> 00:11:46.070 Genome Project. And they then

NOTE Confidence: 0.9596174

00:11:46.290 --> 00:11:47.890 authorized that the Human Genome

NOTE Confidence: 0.9596174

00:11:47.890 --> 00:11:50.290 Project begin, created an entity

NOTE Confidence: 0.9596174

00:11:50.290 --> 00:11:51.410 at NIH to do it,

NOTE Confidence: 0.9596174

00:11:51.410 --> 00:11:53.054 and most importantly, wrote a

NOTE Confidence: 0.9596174

00:11:53.054 --> 00:11:54.095 check to get the Human

NOTE Confidence: 0.9596174

00:11:54.095 --> 00:11:55.615 Genome Project off the ground

NOTE Confidence: 0.9596174

00:11:55.615 --> 00:11:57.295 in the subsequent year. Other

NOTE Confidence: 0.9596174

00:11:57.295 --> 00:11:58.415 funders came in from other

NOTE Confidence: 0.9596174

00:11:58.415 --> 00:12:00.115 countries and particularly the UK,

NOTE Confidence: 0.9703275

00:12:00.495 --> 00:12:02.015 and therefore, it was all

NOTE Confidence: 0.9703275

00:12:02.015 --> 00:12:03.054 teed up to start the

NOTE Confidence: 0.9703275

00:12:03.054 --> 00:12:04.275 Human Genome Project.

NOTE Confidence: 0.9708154

00:12:05.230 --> 00:12:06.670 I think that nineteen oh,

NOTE Confidence: 0.9708154

00:12:06.670 --> 00:12:07.390 you can't quite see it,

NOTE Confidence: 0.9708154

00:12:07.390 --> 00:12:08.030 but you'll see it in

NOTE Confidence: 0.9708154

00:12:08.030 --> 00:12:09.650 a second. Nineteen eighty nine,

NOTE Confidence: 0.9708154

00:12:09.870 --> 00:12:11.230 it'll always be regarded as

NOTE Confidence: 0.9708154

00:12:11.230 --> 00:12:13.150 a pivotal year where sort

NOTE Confidence: 0.9708154

00:12:13.150 --> 00:12:14.110 of the world just seemed

NOTE Confidence: 0.9708154

00:12:14.110 --> 00:12:15.309 to change in nineteen eighty

NOTE Confidence: 0.9708154

00:12:15.309 --> 00:12:16.910 nine as everything was was

NOTE Confidence: 0.9708154

00:12:16.910 --> 00:12:18.930 moving towards these incredible things.

NOTE Confidence: 0.96575683

00:12:19.265 --> 00:12:21.265 So so I will make

NOTE Confidence: 0.96575683

00:12:21.265 --> 00:12:23.184 the strong argument that the

NOTE Confidence: 0.96575683

00:12:23.184 --> 00:12:24.725 world changed in eighty nine.

NOTE Confidence: 0.96575683

00:12:24.785 --> 00:12:25.585 You know, first of all,

NOTE Confidence: 0.96575683

00:12:25.585 --> 00:12:26.785 we should appreciate that eighty

NOTE Confidence: 0.96575683

00:12:26.785 --> 00:12:27.825 nine is when Taylor Swift

NOTE Confidence: 0.96575683

00:12:27.825 --> 00:12:29.105 was born. Okay? So, you

NOTE Confidence: 0.96575683

00:12:29.105 --> 00:12:30.145 know, you could say whatever

NOTE Confidence: 0.96575683

00:12:30.145 --> 00:12:31.105 you want, but the world

NOTE Confidence: 0.96575683

00:12:31.105 --> 00:12:32.225 has never been the same

NOTE Confidence: 0.96575683

00:12:32.225 --> 00:12:33.990 after that. So appreciate it.

NOTE Confidence: 0.96575683

00:12:34.149 --> 00:12:35.190 But I also think that

NOTE Confidence: 0.96575683

00:12:35.190 --> 00:12:36.630 we will look back, especially

NOTE Confidence: 0.96575683

00:12:36.630 --> 00:12:38.149 as physicians and scientists and

NOTE Confidence: 0.96575683

00:12:38.149 --> 00:12:39.990 biologists, as eighty nine being

NOTE Confidence: 0.96575683

00:12:39.990 --> 00:12:42.070 in a pivotal year because

NOTE Confidence: 0.96575683

00:12:42.070 --> 00:12:43.110 eighty nine was when the

NOTE Confidence: 0.96575683

00:12:43.110 --> 00:12:44.390 Human Genome Project was about

NOTE Confidence: 0.96575683

00:12:44.390 --> 00:12:45.670 to be born. And so

NOTE Confidence: 0.96575683

00:12:45.670 --> 00:12:47.130 there you are, eighty nine,

NOTE Confidence: 0.98200136

00:12:47.495 --> 00:12:48.695 gonna be blazoned into the

NOTE Confidence: 0.98200136

00:12:48.695 --> 00:12:50.134 history books for two very

NOTE Confidence: 0.98200136

00:12:50.134 --> 00:12:51.035 important reasons.

NOTE Confidence: 0.9474945

00:12:51.654 --> 00:12:52.855 But that, of course, led

NOTE Confidence: 0.9474945

00:12:52.855 --> 00:12:53.574 to the launching of the

NOTE Confidence: 0.9474945

00:12:53.574 --> 00:12:55.175 human genome project in nineteen

NOTE Confidence: 0.9474945

00:12:55.175 --> 00:12:55.675 ninety.

NOTE Confidence: 0.9366344

00:12:56.695 --> 00:12:57.894 It was really as its

NOTE Confidence: 0.9366344

00:12:57.894 --> 00:12:59.654 signature goal was about reading

NOTE Confidence: 0.9366344

00:12:59.654 --> 00:13:01.330 the human blueprint, other genomes

NOTE Confidence: 0.9366344

00:13:01.330 --> 00:13:03.089 were sweet sequenced smaller organisms,

NOTE Confidence: 0.9366344

00:13:03.089 --> 00:13:03.910 smaller genomes.

NOTE Confidence: 0.9889323

00:13:04.370 --> 00:13:06.050 But the signature goal was

NOTE Confidence: 0.9889323

00:13:06.050 --> 00:13:06.850 to read out for the

NOTE Confidence: 0.9889323

00:13:06.850 --> 00:13:07.970 very first time the three

NOTE Confidence: 0.9889323

00:13:07.970 --> 00:13:10.130 billion letters that represents one

NOTE Confidence: 0.9889323

00:13:10.130 --> 00:13:11.670 copy of the human genome.

NOTE Confidence: 0.9889323

00:13:11.970 --> 00:13:13.649 And this will forever be

NOTE Confidence: 0.9889323

00:13:13.649 --> 00:13:15.190 regarded as biology's

NOTE Confidence: 0.9185303

00:13:15.855 --> 00:13:17.214 most ambitious or at least

NOTE Confidence: 0.9185303

00:13:17.214 --> 00:13:19.235 its very first incredibly ambitious,

NOTE Confidence: 0.94400615

00:13:19.855 --> 00:13:21.455 endeavor. Now for those who

NOTE Confidence: 0.94400615

00:13:21.455 --> 00:13:23.295 don't, especially the younger folks,

NOTE Confidence: 0.94400615

00:13:23.295 --> 00:13:25.214 don't appreciate, the Human Genome

NOTE Confidence: 0.94400615

00:13:25.214 --> 00:13:26.755 Project was very unusual.

NOTE Confidence: 0.9854273

00:13:27.375 --> 00:13:28.575 It was it was not

NOTE Confidence: 0.9854273

00:13:28.575 --> 00:13:30.250 typical for biologists to do

NOTE Confidence: 0.9854273

00:13:30.250 --> 00:13:32.410 big organized projects involving thousands

NOTE Confidence: 0.9854273

00:13:32.410 --> 00:13:34.250 of scientists, multiple countries. It

NOTE Confidence: 0.9854273

00:13:34.250 --> 00:13:35.929 was not typical to have

NOTE Confidence: 0.9854273

00:13:35.929 --> 00:13:37.230 it be highly managed.

NOTE Confidence: 0.990625

00:13:38.009 --> 00:13:39.370 It had a lot of,

NOTE Confidence: 0.9638536

00:13:39.929 --> 00:13:41.690 individuals in the scientific community

NOTE Confidence: 0.9638536

00:13:41.690 --> 00:13:43.014 who were against it, who

NOTE Confidence: 0.9638536

00:13:43.014 --> 00:13:43.975 didn't believe it was a

NOTE Confidence: 0.9638536

00:13:43.975 --> 00:13:45.415 good idea. And so there

NOTE Confidence: 0.9638536

00:13:45.415 --> 00:13:46.295 was just not a simp

NOTE Confidence: 0.9638536

00:13:46.535 --> 00:13:47.495 a single aspect of the

NOTE Confidence: 0.9638536

00:13:47.495 --> 00:13:48.695 Human Genome Project that was

NOTE Confidence: 0.9638536

00:13:48.695 --> 00:13:49.195 conventional.

NOTE Confidence: 0.9857531

00:13:49.574 --> 00:13:51.334 But despite headwinds, lots of

NOTE Confidence: 0.9857531

00:13:51.334 --> 00:13:52.615 concerns about whether it'd be

NOTE Confidence: 0.9857531

00:13:52.615 --> 00:13:54.855 successful, etcetera, etcetera, at the

NOTE Confidence: 0.9857531

00:13:54.855 --> 00:13:55.975 end of the day, thirteen

NOTE Confidence: 0.9857531

00:13:55.975 --> 00:13:57.334 years later, the Human Genome

NOTE Confidence: 0.9857531

00:13:57.334 --> 00:13:59.010 Project was completed and by

NOTE Confidence: 0.9857531

00:13:59.010 --> 00:14:00.770 any criteria was regarded as

NOTE Confidence: 0.9857531

00:14:00.770 --> 00:14:01.910 a successful endeavor.

NOTE Confidence: 0.94617414

00:14:03.410 --> 00:14:05.490 And so what happened, literally

NOTE Confidence: 0.94617414

00:14:05.490 --> 00:14:06.530 now, I think we're getting

NOTE Confidence: 0.94617414

00:14:06.610 --> 00:14:07.650 yeah. It's like twenty six

NOTE Confidence: 0.94617414

00:14:07.650 --> 00:14:08.290 years ago.

NOTE Confidence: 0.9334626

00:14:08.770 --> 00:14:09.650 And in fact, we're just

NOTE Confidence: 0.9334626

00:14:09.650 --> 00:14:10.850 over twenty six years ago.

NOTE Confidence: 0.9334626

00:14:10.850 --> 00:14:11.890 I'm gonna be sorry. Twenty

NOTE Confidence: 0.9334626

00:14:11.890 --> 00:14:13.670 three years ago, almost exactly

NOTE Confidence: 0.9334626

00:14:13.815 --> 00:14:15.335 the Genome Project was declared

NOTE Confidence: 0.9334626

00:14:15.335 --> 00:14:17.255 completed. There were some incredibly

NOTE Confidence: 0.9334626

00:14:17.255 --> 00:14:19.095 good parties and celebrations that

NOTE Confidence: 0.9334626

00:14:19.095 --> 00:14:20.295 that took place around that

NOTE Confidence: 0.9334626

00:14:20.295 --> 00:14:22.535 time. And it's important to

NOTE Confidence: 0.9334626

00:14:22.535 --> 00:14:24.215 recognize that what the Genome

NOTE Confidence: 0.9334626

00:14:24.215 --> 00:14:26.155 Project delivered to humanity

NOTE Confidence: 0.9963191

00:14:26.730 --> 00:14:27.850 was the order of the

NOTE Confidence: 0.9963191

00:14:27.850 --> 00:14:29.370 roughly three billion letters in

NOTE Confidence: 0.9963191

00:14:29.370 --> 00:14:30.270 the human genome.

NOTE Confidence: 0.9921248

00:14:30.970 --> 00:14:32.250 Of course, that just gave

NOTE Confidence: 0.9921248

00:14:32.250 --> 00:14:33.770 us the ordered letters. It

NOTE Confidence: 0.9921248

00:14:33.770 --> 00:14:35.070 didn't give us an interpretation.

NOTE Confidence: 0.9921248

00:14:35.209 --> 00:14:36.250 We knew that was gonna

NOTE Confidence: 0.9921248

00:14:36.250 --> 00:14:37.370 follow, but at least it

NOTE Confidence: 0.9921248

00:14:37.370 --> 00:14:38.730 gave us a framework that

NOTE Confidence: 0.9921248

00:14:38.730 --> 00:14:39.930 everything could then be built

NOTE Confidence: 0.9921248

00:14:39.930 --> 00:14:41.644 on. And so one important

NOTE Confidence: 0.9921248

00:14:41.644 --> 00:14:43.084 thing to appreciate about where

NOTE Confidence: 0.9921248

00:14:43.084 --> 00:14:44.285 we were twenty three years

NOTE Confidence: 0.9921248

00:14:44.285 --> 00:14:45.725 ago is that we had

NOTE Confidence: 0.9921248

00:14:45.725 --> 00:14:47.885 just crossed the initial finish

NOTE Confidence: 0.9921248

00:14:47.885 --> 00:14:49.485 line in the journey of

NOTE Confidence: 0.9921248

00:14:49.485 --> 00:14:51.165 human genomics, and that will

NOTE Confidence: 0.9921248

00:14:51.165 --> 00:14:52.385 forever be a historic,

NOTE Confidence: 0.98168945

00:14:52.764 --> 00:14:54.144 of of historic significance.

NOTE Confidence: 0.9995117

00:14:54.605 --> 00:14:55.105 However,

NOTE Confidence: 0.95092773

00:14:55.509 --> 00:14:56.389 as all of you can

NOTE Confidence: 0.95092773

00:14:56.389 --> 00:14:56.889 appreciate,

NOTE Confidence: 0.9551351

00:14:57.269 --> 00:14:58.810 that's just when everything began

NOTE Confidence: 0.9551351

00:14:58.949 --> 00:15:00.470 because that finish line immediately

NOTE Confidence: 0.9551351

00:15:00.470 --> 00:15:01.670 became a starting line. It's

NOTE Confidence: 0.9551351

00:15:01.670 --> 00:15:03.110 this classic example that you

NOTE Confidence: 0.9551351

00:15:03.110 --> 00:15:03.990 finish one thing and you

NOTE Confidence: 0.9551351

00:15:03.990 --> 00:15:05.690 immediately are gonna start another.

NOTE Confidence: 0.9827236

00:15:06.149 --> 00:15:07.529 And so a lot happened

NOTE Confidence: 0.9827236

00:15:07.589 --> 00:15:09.130 when the Genome Project ended.

NOTE Confidence: 0.9827236

00:15:09.269 --> 00:15:10.709 The different funders had different

NOTE Confidence: 0.9827236

00:15:10.709 --> 00:15:12.103 reasons for being there. For

NOTE Confidence: 0.9827236

00:15:12.103 --> 00:15:13.338 example, the other major funder

NOTE Confidence: 0.9827236

00:15:13.338 --> 00:15:14.574 in the United States was

NOTE Confidence: 0.9827236

00:15:14.574 --> 00:15:15.810 the Department of Energy. They

NOTE Confidence: 0.9827236

00:15:15.810 --> 00:15:17.045 had a whole other reason

NOTE Confidence: 0.9827236

00:15:17.045 --> 00:15:18.281 for wanting to sequence the

NOTE Confidence: 0.9827236

00:15:18.281 --> 00:15:19.516 human genome. They went off

NOTE Confidence: 0.9827236

00:15:19.516 --> 00:15:20.752 in a different direction. But

NOTE Confidence: 0.9827236

00:15:20.999 --> 00:15:22.481 and but and various other

NOTE Confidence: 0.9827236

00:15:22.481 --> 00:15:23.717 funders around the world, they

NOTE Confidence: 0.9827236

00:15:23.717 --> 00:15:24.952 did different things in genomics

NOTE Confidence: 0.9827236

00:15:24.952 --> 00:15:26.320 subsequently. But back at the

NOTE Confidence: 0.9827236

00:15:26.320 --> 00:15:28.320 National Institutes of Health, as

NOTE Confidence: 0.9827236

00:15:28.320 --> 00:15:29.760 you might imagine, the focus

NOTE Confidence: 0.9827236

00:15:29.760 --> 00:15:30.800 was gonna be on human

NOTE Confidence: 0.9827236

00:15:30.800 --> 00:15:31.920 health, and that's why the

NOTE Confidence: 0.9827236

00:15:31.920 --> 00:15:33.120 NIH played such a major

NOTE Confidence: 0.9827236

00:15:33.120 --> 00:15:34.160 role in the Human Genome

NOTE Confidence: 0.9827236

00:15:34.160 --> 00:15:34.660 Project.

NOTE Confidence: 0.99564034

00:15:35.520 --> 00:15:37.200 And the reason this became

NOTE Confidence: 0.99564034

00:15:37.200 --> 00:15:38.640 so important went back to

NOTE Confidence: 0.99564034

00:15:38.640 --> 00:15:39.540 one of the premises

NOTE Confidence: 0.9556327

00:15:40.055 --> 00:15:41.415 that was stated in any

NOTE Confidence: 0.9556327

00:15:41.415 --> 00:15:42.375 of the things written about

NOTE Confidence: 0.9556327

00:15:42.375 --> 00:15:43.175 that led up to the

NOTE Confidence: 0.9556327

00:15:43.175 --> 00:15:44.574 Human Genome Project, and that

NOTE Confidence: 0.9556327

00:15:44.694 --> 00:15:45.415 and which I think was

NOTE Confidence: 0.9556327

00:15:45.415 --> 00:15:47.175 a very compelling argument, including

NOTE Confidence: 0.9556327

00:15:47.175 --> 00:15:48.714 to the senators who ultimately

NOTE Confidence: 0.9556327

00:15:48.774 --> 00:15:50.375 approved this, was that we

NOTE Confidence: 0.9556327

00:15:50.375 --> 00:15:51.334 can go in and say

NOTE Confidence: 0.9556327

00:15:51.334 --> 00:15:53.334 that virtually everything that Dave

NOTE Confidence: 0.9556327

00:15:53.334 --> 00:15:54.214 and I were taught in

NOTE Confidence: 0.9556327

00:15:54.214 --> 00:15:55.980 medical school was based on

NOTE Confidence: 0.9556327

00:15:55.980 --> 00:15:57.820 the average patient. But no

NOTE Confidence: 0.9556327

00:15:57.820 --> 00:15:59.260 patient is average. Every patient

NOTE Confidence: 0.9556327

00:15:59.260 --> 00:16:00.380 is unique. They bring with

NOTE Confidence: 0.9556327

00:16:00.380 --> 00:16:01.900 them their unique physical and

NOTE Confidence: 0.9556327

00:16:01.900 --> 00:16:02.400 social

NOTE Confidence: 0.9612723

00:16:02.780 --> 00:16:04.300 environments. They also bring a

NOTE Confidence: 0.9612723

00:16:04.300 --> 00:16:06.300 unique blueprint because every two

NOTE Confidence: 0.9612723

00:16:06.300 --> 00:16:07.420 people are different unless they're

NOTE Confidence: 0.9612723

00:16:07.420 --> 00:16:09.260 twins, identical twins. But bottom

NOTE Confidence: 0.9612723

00:16:09.260 --> 00:16:10.700 line is no patient is

NOTE Confidence: 0.9612723

00:16:10.700 --> 00:16:12.595 average. Every patient is unique,

NOTE Confidence: 0.9612723

00:16:12.595 --> 00:16:13.894 and yet we are blind

NOTE Confidence: 0.9795968

00:16:14.435 --> 00:16:15.875 to the uniqueness in their

NOTE Confidence: 0.9795968

00:16:15.875 --> 00:16:16.915 DNA, but we don't have

NOTE Confidence: 0.9795968

00:16:16.915 --> 00:16:18.115 to be if we could

NOTE Confidence: 0.9795968

00:16:18.115 --> 00:16:19.555 have the ability to query

NOTE Confidence: 0.9795968

00:16:19.555 --> 00:16:21.394 people's DNA and use information

NOTE Confidence: 0.9795968

00:16:21.394 --> 00:16:22.295 about their differences

NOTE Confidence: 0.958374

00:16:22.755 --> 00:16:24.115 in order to improve the

NOTE Confidence: 0.958374

00:16:24.115 --> 00:16:25.095 practice of medicine.

NOTE Confidence: 0.9786468

00:16:25.770 --> 00:16:26.810 So there we were at

NOTE Confidence: 0.9786468

00:16:26.810 --> 00:16:27.690 a new starting line, and

NOTE Confidence: 0.9786468

00:16:27.690 --> 00:16:28.890 it was pretty obvious what

NOTE Confidence: 0.9786468

00:16:28.890 --> 00:16:30.090 was gonna happen. We were

NOTE Confidence: 0.9786468

00:16:30.090 --> 00:16:32.030 gonna use genomics in medicine.

NOTE Confidence: 0.9786468

00:16:32.330 --> 00:16:33.290 So none of us were

NOTE Confidence: 0.9786468

00:16:33.290 --> 00:16:34.830 surprised that either the popular

NOTE Confidence: 0.9786468

00:16:34.890 --> 00:16:36.670 press or the scientific press

NOTE Confidence: 0.9786468

00:16:36.970 --> 00:16:38.330 juxtaposed the two words. Of

NOTE Confidence: 0.9786468

00:16:38.330 --> 00:16:39.690 course, they're gonna juxtapose the

NOTE Confidence: 0.9786468

00:16:39.690 --> 00:16:40.635 two words. They're gonna put

NOTE Confidence: 0.9786468

00:16:40.635 --> 00:16:41.675 the words together and come

NOTE Confidence: 0.9786468

00:16:41.675 --> 00:16:42.395 up with a phrase like

NOTE Confidence: 0.9786468

00:16:42.395 --> 00:16:43.295 genomic medicine.

NOTE Confidence: 0.962355

00:16:43.755 --> 00:16:44.795 There was only one problem

NOTE Confidence: 0.962355

00:16:44.795 --> 00:16:45.835 with twenty three years ago,

NOTE Confidence: 0.962355

00:16:45.835 --> 00:16:46.635 is that we could spell

NOTE Confidence: 0.962355

00:16:46.635 --> 00:16:47.835 genomic medicine and we could

NOTE Confidence: 0.962355

00:16:47.835 --> 00:16:49.435 juxtapose the words, but it

NOTE Confidence: 0.962355

00:16:49.435 --> 00:16:50.815 was a very blurry concept.

NOTE Confidence: 0.962355

00:16:51.035 --> 00:16:52.075 We really had no idea

NOTE Confidence: 0.962355

00:16:52.075 --> 00:16:52.875 what that was gonna look

NOTE Confidence: 0.962355

00:16:52.875 --> 00:16:53.675 like nor how we were

NOTE Confidence: 0.962355

00:16:53.675 --> 00:16:55.135 gonna actually get there.

NOTE Confidence: 0.966463

00:16:55.560 --> 00:16:57.640 Now we appreciated what it

NOTE Confidence: 0.966463

00:16:57.640 --> 00:16:59.480 might involve in terms of

NOTE Confidence: 0.966463

00:16:59.560 --> 00:17:00.920 from a definitional point of

NOTE Confidence: 0.966463

00:17:00.920 --> 00:17:02.300 view, and it was basically

NOTE Confidence: 0.966463

00:17:02.520 --> 00:17:04.619 get genomic information about patients

NOTE Confidence: 0.966463

00:17:04.680 --> 00:17:06.119 and use that information in

NOTE Confidence: 0.966463

00:17:06.119 --> 00:17:07.560 some way to either prevent

NOTE Confidence: 0.966463

00:17:07.560 --> 00:17:09.160 disease or to diagnose disease

NOTE Confidence: 0.966463

00:17:09.160 --> 00:17:10.965 or maybe even perhaps even

NOTE Confidence: 0.966463

00:17:10.965 --> 00:17:12.105 to help treat disease.

NOTE Confidence: 0.9759696

00:17:12.484 --> 00:17:13.845 So that was where we

NOTE Confidence: 0.9759696

00:17:13.845 --> 00:17:14.585 were heading,

NOTE Confidence: 0.98762536

00:17:14.885 --> 00:17:16.565 and we now had to

NOTE Confidence: 0.98762536

00:17:16.565 --> 00:17:18.165 pivot. So twenty three years

NOTE Confidence: 0.98762536

00:17:18.165 --> 00:17:19.945 ago, the Genome Institute and

NOTE Confidence: 0.98762536

00:17:20.085 --> 00:17:21.045 much of the field of

NOTE Confidence: 0.98762536

00:17:21.045 --> 00:17:22.885 human genomics pivoted. They didn't

NOTE Confidence: 0.98762536

00:17:22.885 --> 00:17:24.850 abandon. They just pivoted to

NOTE Confidence: 0.98762536

00:17:24.850 --> 00:17:25.909 include a larger

NOTE Confidence: 0.9797363

00:17:26.530 --> 00:17:27.350 next journey

NOTE Confidence: 0.9366096

00:17:27.730 --> 00:17:29.090 that had a new starting

NOTE Confidence: 0.9366096

00:17:29.090 --> 00:17:30.130 line of the human genome

NOTE Confidence: 0.9366096

00:17:30.130 --> 00:17:31.169 project and had as its

NOTE Confidence: 0.9366096

00:17:31.169 --> 00:17:32.049 finish line,

NOTE Confidence: 0.9927301

00:17:32.369 --> 00:17:33.429 even more audacious,

NOTE Confidence: 0.9408366

00:17:34.289 --> 00:17:36.369 goal that is realizing genomic

NOTE Confidence: 0.9408366

00:17:36.369 --> 00:17:36.869 medicine.

NOTE Confidence: 0.9844282

00:17:37.355 --> 00:17:38.395 And just like the Genome

NOTE Confidence: 0.9844282

00:17:38.395 --> 00:17:39.355 Project, it was gonna be

NOTE Confidence: 0.9844282

00:17:39.355 --> 00:17:40.555 a long journey. And just

NOTE Confidence: 0.9844282

00:17:40.555 --> 00:17:41.675 like the Genome Project, we

NOTE Confidence: 0.9844282

00:17:41.675 --> 00:17:42.395 didn't know what all the

NOTE Confidence: 0.9844282

00:17:42.395 --> 00:17:43.355 steps were gonna be, but

NOTE Confidence: 0.9844282

00:17:43.355 --> 00:17:43.994 we knew what some of

NOTE Confidence: 0.9844282

00:17:43.994 --> 00:17:45.275 the steps were gonna be.

NOTE Confidence: 0.9844282

00:17:45.275 --> 00:17:46.795 And just like the Human

NOTE Confidence: 0.9844282

00:17:46.795 --> 00:17:48.155 Genome Project, it was not

NOTE Confidence: 0.9844282

00:17:48.155 --> 00:17:49.595 gonna be completed by one

NOTE Confidence: 0.9844282

00:17:49.595 --> 00:17:51.675 scientist, one institution, one funder,

NOTE Confidence: 0.9844282

00:17:51.675 --> 00:17:53.350 one country, one discipline, and

NOTE Confidence: 0.9844282

00:17:53.350 --> 00:17:54.149 it was not gonna be

NOTE Confidence: 0.9844282

00:17:54.149 --> 00:17:55.350 a sprint. It was gonna

NOTE Confidence: 0.9844282

00:17:55.350 --> 00:17:56.090 be a marathon.

NOTE Confidence: 0.97318286

00:17:56.629 --> 00:17:58.230 Lots of different disciplines coming

NOTE Confidence: 0.97318286

00:17:58.230 --> 00:17:59.750 together, running shoulder to shoulder

NOTE Confidence: 0.97318286

00:17:59.750 --> 00:18:00.710 for a very long time

NOTE Confidence: 0.97318286

00:18:00.710 --> 00:18:02.149 and just figuring out what

NOTE Confidence: 0.97318286

00:18:02.149 --> 00:18:03.109 were the steps that were

NOTE Confidence: 0.97318286

00:18:03.109 --> 00:18:04.230 gonna be needed, what were

NOTE Confidence: 0.97318286

00:18:04.230 --> 00:18:05.669 the obstacles, knock them down,

NOTE Confidence: 0.97318286

00:18:05.669 --> 00:18:06.789 and keep inching your way

NOTE Confidence: 0.97318286

00:18:06.789 --> 00:18:08.385 closer and closer to get

NOTE Confidence: 0.97318286

00:18:08.385 --> 00:18:10.065 into the realization of genomic

NOTE Confidence: 0.97318286

00:18:10.065 --> 00:18:10.565 medicine.

NOTE Confidence: 0.992513

00:18:11.345 --> 00:18:12.145 So how do you do

NOTE Confidence: 0.992513

00:18:12.145 --> 00:18:13.665 that? Well, I was fortunate

NOTE Confidence: 0.992513

00:18:13.665 --> 00:18:14.545 enough to have a front

NOTE Confidence: 0.992513

00:18:14.545 --> 00:18:15.425 row seat. I was, at

NOTE Confidence: 0.992513

00:18:15.425 --> 00:18:16.385 that point, already in a

NOTE Confidence: 0.992513

00:18:16.385 --> 00:18:17.285 leadership position

NOTE Confidence: 0.9279785

00:18:17.585 --> 00:18:18.325 at NHGRI.

NOTE Confidence: 0.9310942

00:18:19.984 --> 00:18:21.185 And I was the director

NOTE Confidence: 0.9310942

00:18:21.185 --> 00:18:22.385 of the intramural program when

NOTE Confidence: 0.9310942

00:18:22.385 --> 00:18:24.010 the Genome Project ended two

NOTE Confidence: 0.9310942

00:18:24.010 --> 00:18:25.530 thousand three. Now the Genome

NOTE Confidence: 0.9310942

00:18:25.530 --> 00:18:26.030 Institute,

NOTE Confidence: 0.9661655

00:18:26.410 --> 00:18:27.929 just as a representative example

NOTE Confidence: 0.9661655

00:18:27.929 --> 00:18:28.650 of what had to happen,

NOTE Confidence: 0.9661655

00:18:28.650 --> 00:18:29.850 they had to pivot, and

NOTE Confidence: 0.9661655

00:18:29.850 --> 00:18:30.890 they had to develop a

NOTE Confidence: 0.9661655

00:18:30.890 --> 00:18:32.090 vision to how to get

NOTE Confidence: 0.9661655

00:18:32.090 --> 00:18:33.309 us to genomic medicine.

NOTE Confidence: 0.97170186

00:18:33.929 --> 00:18:34.890 Well, the way we did

NOTE Confidence: 0.97170186

00:18:34.890 --> 00:18:36.010 it, I can tell you,

NOTE Confidence: 0.97170186

00:18:36.010 --> 00:18:37.325 is that we took sort

NOTE Confidence: 0.97170186

00:18:37.325 --> 00:18:38.765 of, a routine that we

NOTE Confidence: 0.97170186

00:18:38.765 --> 00:18:39.885 had developed during the Genome

NOTE Confidence: 0.97170186

00:18:39.885 --> 00:18:41.885 Project of gathering the scientific

NOTE Confidence: 0.97170186

00:18:41.885 --> 00:18:44.045 community together and updating the

NOTE Confidence: 0.97170186

00:18:44.045 --> 00:18:45.085 idea of how you're gonna

NOTE Confidence: 0.97170186

00:18:45.085 --> 00:18:46.285 accomplish the goals in front

NOTE Confidence: 0.97170186

00:18:46.285 --> 00:18:47.165 of you. We're shown here

NOTE Confidence: 0.97170186

00:18:47.165 --> 00:18:48.865 sort of three classic documents

NOTE Confidence: 0.97599286

00:18:49.165 --> 00:18:50.525 that were published at at

NOTE Confidence: 0.97599286

00:18:50.525 --> 00:18:51.725 different stages of the Human

NOTE Confidence: 0.97599286

00:18:51.725 --> 00:18:52.500 Genome Project

NOTE Confidence: 0.97723174

00:18:52.900 --> 00:18:54.500 that that that basically iterated

NOTE Confidence: 0.97723174

00:18:54.500 --> 00:18:56.020 and then reiterated how to

NOTE Confidence: 0.97723174

00:18:56.020 --> 00:18:57.560 complete the Human Genome Project.

NOTE Confidence: 0.97723174

00:18:57.700 --> 00:18:58.660 And so the day the

NOTE Confidence: 0.97723174

00:18:58.660 --> 00:19:00.600 Human Genome Project ended, NHGRI

NOTE Confidence: 0.97723174

00:19:00.660 --> 00:19:01.700 had finished a two year

NOTE Confidence: 0.97723174

00:19:01.700 --> 00:19:03.700 strategic planning process that laid

NOTE Confidence: 0.97723174

00:19:03.700 --> 00:19:05.300 out a new blueprint for

NOTE Confidence: 0.97723174

00:19:05.300 --> 00:19:06.260 what needed to happen in

NOTE Confidence: 0.97723174

00:19:06.260 --> 00:19:07.725 genomics. And then eight years

NOTE Confidence: 0.97723174

00:19:07.725 --> 00:19:08.685 later, it was time to

NOTE Confidence: 0.97723174

00:19:08.685 --> 00:19:10.125 publish a new one. And

NOTE Confidence: 0.97723174

00:19:10.125 --> 00:19:11.984 and and, and then shortly

NOTE Confidence: 0.97723174

00:19:12.205 --> 00:19:13.244 nine years later, it was

NOTE Confidence: 0.97723174

00:19:13.244 --> 00:19:14.385 in during the pandemic,

NOTE Confidence: 0.95363724

00:19:15.005 --> 00:19:16.205 we published the most recent

NOTE Confidence: 0.95363724

00:19:16.205 --> 00:19:17.325 one, which the institute is

NOTE Confidence: 0.95363724

00:19:17.325 --> 00:19:19.185 still going on. These basically

NOTE Confidence: 0.95363724

00:19:19.244 --> 00:19:20.930 became road maps or blueprints,

NOTE Confidence: 0.95363724

00:19:20.930 --> 00:19:22.210 whatever metaphor you wanna use,

NOTE Confidence: 0.95363724

00:19:22.210 --> 00:19:23.430 not only for the institute,

NOTE Confidence: 0.95363724

00:19:23.570 --> 00:19:24.690 but more broadly for the

NOTE Confidence: 0.95363724

00:19:24.690 --> 00:19:25.730 community of what were the

NOTE Confidence: 0.95363724

00:19:25.730 --> 00:19:27.330 steps that we're gonna need

NOTE Confidence: 0.95363724

00:19:27.330 --> 00:19:28.290 in order to get us

NOTE Confidence: 0.95363724

00:19:28.290 --> 00:19:28.790 towards,

NOTE Confidence: 0.9945359

00:19:29.250 --> 00:19:30.850 improving the practice of medicine

NOTE Confidence: 0.9945359

00:19:30.850 --> 00:19:31.590 through genomics.

NOTE Confidence: 0.994043

00:19:32.369 --> 00:19:34.154 And so twenty three years

NOTE Confidence: 0.994043

00:19:34.154 --> 00:19:35.934 of progress have been basically,

NOTE Confidence: 0.97062767

00:19:36.315 --> 00:19:38.075 represented by these three strategic

NOTE Confidence: 0.97062767

00:19:38.075 --> 00:19:39.434 visions, and I don't have

NOTE Confidence: 0.97062767

00:19:39.434 --> 00:19:40.634 time to go through all

NOTE Confidence: 0.97062767

00:19:40.634 --> 00:19:41.755 twenty three years nor do

NOTE Confidence: 0.97062767

00:19:41.755 --> 00:19:42.475 I have time to go

NOTE Confidence: 0.97062767

00:19:42.475 --> 00:19:43.755 through all of them. Knowing

NOTE Confidence: 0.97062767

00:19:43.755 --> 00:19:44.955 I was given a clinical

NOTE Confidence: 0.97062767

00:19:44.955 --> 00:19:46.554 grand rounds, I thought I

NOTE Confidence: 0.97062767

00:19:46.554 --> 00:19:48.494 would would just briefly summarize

NOTE Confidence: 0.97062767

00:19:48.634 --> 00:19:50.530 the more proximal steps so

NOTE Confidence: 0.97062767

00:19:50.530 --> 00:19:51.810 that I could emphasize the

NOTE Confidence: 0.97062767

00:19:51.810 --> 00:19:53.210 more clinical ones. And it

NOTE Confidence: 0.97062767

00:19:53.250 --> 00:19:53.970 but it's not to say

NOTE Confidence: 0.97062767

00:19:53.970 --> 00:19:55.170 that the more proximal basic

NOTE Confidence: 0.97062767

00:19:55.170 --> 00:19:56.450 science and translational science is

NOTE Confidence: 0.97062767

00:19:56.450 --> 00:19:57.570 not important. It's just I

NOTE Confidence: 0.97062767

00:19:57.570 --> 00:19:58.450 was just trying to figure

NOTE Confidence: 0.97062767

00:19:58.450 --> 00:19:59.410 out how to best allocate

NOTE Confidence: 0.97062767

00:19:59.410 --> 00:20:00.450 the time to an audience

NOTE Confidence: 0.97062767

00:20:00.450 --> 00:20:01.890 like this. So what are

NOTE Confidence: 0.97062767

00:20:01.890 --> 00:20:03.730 the more proximal accomplishments? What

NOTE Confidence: 0.97062767

00:20:03.730 --> 00:20:05.109 was the very first step

NOTE Confidence: 0.970738

00:20:05.705 --> 00:20:06.925 that needed to be accomplished?

NOTE Confidence: 0.970738

00:20:07.145 --> 00:20:08.025 Well, the first step is

NOTE Confidence: 0.970738

00:20:08.025 --> 00:20:09.325 probably the most remarkable.

NOTE Confidence: 0.97499126

00:20:10.185 --> 00:20:11.465 The fact is when we

NOTE Confidence: 0.97499126

00:20:11.465 --> 00:20:12.665 sequenced the human genome for

NOTE Confidence: 0.97499126

00:20:12.665 --> 00:20:13.545 the very first time and

NOTE Confidence: 0.97499126

00:20:13.545 --> 00:20:14.585 finished it twenty three years

NOTE Confidence: 0.97499126

00:20:14.585 --> 00:20:16.585 ago, it was successful, but

NOTE Confidence: 0.97499126

00:20:16.585 --> 00:20:18.185 it was expensive. Cost about

NOTE Confidence: 0.97499126

00:20:18.185 --> 00:20:19.545 a billion dollars to sequence

NOTE Confidence: 0.97499126

00:20:19.545 --> 00:20:20.640 that first human genome.

NOTE Confidence: 0.96449924

00:20:21.119 --> 00:20:22.560 Well, I was trained as

NOTE Confidence: 0.96449924

00:20:22.560 --> 00:20:24.400 a laboratory medicine physician, and

NOTE Confidence: 0.96449924

00:20:24.400 --> 00:20:25.359 I knew that a billion

NOTE Confidence: 0.96449924

00:20:25.359 --> 00:20:26.480 dollars was too high of

NOTE Confidence: 0.96449924

00:20:26.480 --> 00:20:27.440 a price tag for a

NOTE Confidence: 0.96449924

00:20:27.440 --> 00:20:28.880 clinical test. And I knew

NOTE Confidence: 0.96449924

00:20:28.880 --> 00:20:29.920 that we needed to lop

NOTE Confidence: 0.96449924

00:20:29.920 --> 00:20:30.880 off a lot of zeros

NOTE Confidence: 0.96449924

00:20:30.880 --> 00:20:31.680 to get it down to

NOTE Confidence: 0.96449924

00:20:31.680 --> 00:20:32.960 something that seemed reasonable, and

NOTE Confidence: 0.96449924

00:20:32.960 --> 00:20:34.080 the figure we came up

NOTE Confidence: 0.96449924

00:20:34.080 --> 00:20:35.565 with was a thousand. So

NOTE Confidence: 0.96449924

00:20:35.565 --> 00:20:36.605 it was in in two

NOTE Confidence: 0.96449924

00:20:36.605 --> 00:20:38.125 thousand three where the genome

NOTE Confidence: 0.96449924

00:20:38.125 --> 00:20:39.085 institute said, we need to

NOTE Confidence: 0.96449924

00:20:39.085 --> 00:20:39.804 figure out how we're gonna

NOTE Confidence: 0.96449924

00:20:39.804 --> 00:20:40.924 sequence a human genome for

NOTE Confidence: 0.96449924

00:20:40.924 --> 00:20:42.145 less than a thousand dollars,

NOTE Confidence: 0.9596928

00:20:42.524 --> 00:20:43.725 and the rest is history.

NOTE Confidence: 0.9596928

00:20:43.725 --> 00:20:44.845 We've now reduced the cost

NOTE Confidence: 0.9596928

00:20:44.845 --> 00:20:46.205 of sequencing a human genome

NOTE Confidence: 0.9596928

00:20:46.205 --> 00:20:47.164 by more than a million

NOTE Confidence: 0.9596928

00:20:47.164 --> 00:20:48.365 fold. It is less than

NOTE Confidence: 0.9596928

00:20:48.365 --> 00:20:50.170 a thousand dollars. Companies like

NOTE Confidence: 0.9596928

00:20:50.170 --> 00:20:51.369 Illumina, where I now work,

NOTE Confidence: 0.9596928

00:20:51.369 --> 00:20:52.490 were involved with this, but

NOTE Confidence: 0.9596928

00:20:52.490 --> 00:20:54.090 the Genome Institute was instrumental

NOTE Confidence: 0.9596928

00:20:54.090 --> 00:20:55.050 in putting out grants that

NOTE Confidence: 0.9596928

00:20:55.050 --> 00:20:56.170 helped get us there. Other

NOTE Confidence: 0.9596928

00:20:56.170 --> 00:20:57.710 companies have bought been involved

NOTE Confidence: 0.9596928

00:20:57.850 --> 00:20:58.350 incredibly

NOTE Confidence: 0.9641113

00:20:58.730 --> 00:20:59.230 successful.

NOTE Confidence: 0.9728367

00:20:59.530 --> 00:21:00.650 The fact that in twenty

NOTE Confidence: 0.9728367

00:21:00.650 --> 00:21:01.690 three years, we were able

NOTE Confidence: 0.9728367

00:21:01.690 --> 00:21:02.570 to reduce the cost of

NOTE Confidence: 0.9728367

00:21:02.570 --> 00:21:03.450 saying to make it now

NOTE Confidence: 0.9728367

00:21:03.450 --> 00:21:04.750 a diagnostic test.

NOTE Confidence: 0.96639127

00:21:05.535 --> 00:21:06.494 That has allowed us to

NOTE Confidence: 0.96639127

00:21:06.494 --> 00:21:07.375 go out and not just

NOTE Confidence: 0.96639127

00:21:07.375 --> 00:21:08.815 be happy with one human

NOTE Confidence: 0.96639127

00:21:08.815 --> 00:21:09.935 genome sequence. Now we have

NOTE Confidence: 0.96639127

00:21:09.935 --> 00:21:10.975 millions. In fact, we don't

NOTE Confidence: 0.96639127

00:21:10.975 --> 00:21:11.935 even know how many millions

NOTE Confidence: 0.96639127

00:21:11.935 --> 00:21:13.295 we have because there's publicly

NOTE Confidence: 0.96639127

00:21:13.295 --> 00:21:14.575 available data, and then there's

NOTE Confidence: 0.96639127

00:21:14.575 --> 00:21:15.695 lots of private data out

NOTE Confidence: 0.96639127

00:21:15.695 --> 00:21:17.215 there, that that we don't

NOTE Confidence: 0.96639127

00:21:17.215 --> 00:21:18.575 even know about at at

NOTE Confidence: 0.96639127

00:21:18.575 --> 00:21:19.775 companies and so forth in

NOTE Confidence: 0.96639127

00:21:19.775 --> 00:21:20.515 other countries.

NOTE Confidence: 0.99866986

00:21:20.980 --> 00:21:22.019 And that has given us

NOTE Confidence: 0.99866986

00:21:22.019 --> 00:21:23.220 a lot of information about

NOTE Confidence: 0.99866986

00:21:23.220 --> 00:21:24.820 how we differ. We now

NOTE Confidence: 0.99866986

00:21:24.820 --> 00:21:26.340 have a very precise estimate.

NOTE Confidence: 0.99866986

00:21:26.340 --> 00:21:27.299 We now know that we

NOTE Confidence: 0.99866986

00:21:27.299 --> 00:21:28.679 are, you know, ninety

NOTE Confidence: 0.9988281

00:21:28.980 --> 00:21:31.159 nine point four percent identical

NOTE Confidence: 0.9693338

00:21:31.619 --> 00:21:33.140 between any two people. And

NOTE Confidence: 0.9693338

00:21:33.140 --> 00:21:34.899 that sounds incredibly identical, which

NOTE Confidence: 0.9693338

00:21:34.899 --> 00:21:35.859 it is, but it also

NOTE Confidence: 0.9693338

00:21:35.859 --> 00:21:37.055 means that there's about three

NOTE Confidence: 0.9693338

00:21:37.055 --> 00:21:38.115 to five million

NOTE Confidence: 0.9738556

00:21:38.575 --> 00:21:40.255 spelling differences between any two

NOTE Confidence: 0.9738556

00:21:40.255 --> 00:21:42.015 of our genomes. And and

NOTE Confidence: 0.9738556

00:21:42.015 --> 00:21:43.375 buried within those three to

NOTE Confidence: 0.9738556

00:21:43.375 --> 00:21:45.295 five million different differences in

NOTE Confidence: 0.9738556

00:21:45.295 --> 00:21:47.215 our spelling are some variants

NOTE Confidence: 0.9738556

00:21:47.215 --> 00:21:49.170 that are biologically important, some

NOTE Confidence: 0.9738556

00:21:49.170 --> 00:21:51.090 that are biologically irrelevant, and

NOTE Confidence: 0.9738556

00:21:51.090 --> 00:21:52.050 then a subset of the

NOTE Confidence: 0.9738556

00:21:52.050 --> 00:21:53.330 biologically important ones that are

NOTE Confidence: 0.9738556

00:21:53.330 --> 00:21:54.930 clinically important. And we need

NOTE Confidence: 0.9738556

00:21:54.930 --> 00:21:55.650 to figure out what all

NOTE Confidence: 0.9738556

00:21:55.650 --> 00:21:56.850 that means, and we have

NOTE Confidence: 0.9738556

00:21:56.850 --> 00:21:59.010 incredibly deep catalogs all now

NOTE Confidence: 0.9738556

00:21:59.010 --> 00:22:00.770 publicly available about all the

NOTE Confidence: 0.9738556

00:22:00.770 --> 00:22:02.050 places in the human genome

NOTE Confidence: 0.9738556

00:22:02.050 --> 00:22:03.250 where we know so far

NOTE Confidence: 0.9738556

00:22:03.250 --> 00:22:05.115 people vary what those variants

NOTE Confidence: 0.9738556

00:22:05.115 --> 00:22:06.715 are, and the grand challenge

NOTE Confidence: 0.9738556

00:22:06.715 --> 00:22:07.515 is to figure out which

NOTE Confidence: 0.9738556

00:22:07.515 --> 00:22:08.895 of those variants are biologically

NOTE Confidence: 0.9738556

00:22:09.035 --> 00:22:10.095 and medically important.

NOTE Confidence: 0.9978391

00:22:10.715 --> 00:22:11.835 In order to do that,

NOTE Confidence: 0.9978391

00:22:11.835 --> 00:22:12.955 you need to know how

NOTE Confidence: 0.9978391

00:22:12.955 --> 00:22:14.815 a variant changes genome function.

NOTE Confidence: 0.9978391

00:22:14.955 --> 00:22:15.994 In order to know that,

NOTE Confidence: 0.9978391

00:22:15.994 --> 00:22:16.715 you need to know how

NOTE Confidence: 0.9978391

00:22:16.715 --> 00:22:18.470 the genome works. Well, where

NOTE Confidence: 0.9978391

00:22:18.470 --> 00:22:19.830 are we? Well, we have

NOTE Confidence: 0.9978391

00:22:19.830 --> 00:22:21.750 profoundly advanced in twenty three

NOTE Confidence: 0.9978391

00:22:21.750 --> 00:22:23.030 years of studying those three

NOTE Confidence: 0.9978391

00:22:23.030 --> 00:22:23.930 billion letters

NOTE Confidence: 0.98275757

00:22:24.390 --> 00:22:25.670 of understanding of how the

NOTE Confidence: 0.98275757

00:22:25.670 --> 00:22:26.790 genome works. We know a

NOTE Confidence: 0.98275757

00:22:26.790 --> 00:22:28.470 lot about our twenty thousand

NOTE Confidence: 0.98275757

00:22:28.470 --> 00:22:30.705 genes, roughly twenty thousand. Although

NOTE Confidence: 0.98275757

00:22:30.705 --> 00:22:31.585 we still don't know what

NOTE Confidence: 0.98275757

00:22:31.585 --> 00:22:32.785 the vast majority of those

NOTE Confidence: 0.98275757

00:22:32.785 --> 00:22:34.544 genes actually do. We now

NOTE Confidence: 0.98275757

00:22:34.544 --> 00:22:36.405 know there's an incredible complexity

NOTE Confidence: 0.98275757

00:22:36.544 --> 00:22:37.984 out in the noncoding parts

NOTE Confidence: 0.98275757

00:22:37.984 --> 00:22:39.345 of the human genome that

NOTE Confidence: 0.98275757

00:22:39.345 --> 00:22:40.785 choreograph how all these genes

NOTE Confidence: 0.98275757

00:22:40.785 --> 00:22:42.065 work. We know a lot

NOTE Confidence: 0.98275757

00:22:42.065 --> 00:22:43.169 about that, but we still

NOTE Confidence: 0.98275757

00:22:43.169 --> 00:22:44.129 have a long way to

NOTE Confidence: 0.98275757

00:22:44.129 --> 00:22:45.409 go. In the twenty three

NOTE Confidence: 0.98275757

00:22:45.409 --> 00:22:46.929 years, we've learned that RNA

NOTE Confidence: 0.98275757

00:22:46.929 --> 00:22:48.529 is really complicated. Lots of

NOTE Confidence: 0.98275757

00:22:48.529 --> 00:22:49.649 different kinds of RNAs are

NOTE Confidence: 0.98275757

00:22:49.649 --> 00:22:50.529 doing lots of things that

NOTE Confidence: 0.98275757

00:22:50.529 --> 00:22:51.809 we had never any idea

NOTE Confidence: 0.98275757

00:22:51.809 --> 00:22:52.950 they were actually doing.

NOTE Confidence: 0.9588717

00:22:53.250 --> 00:22:54.529 So the there's good news

NOTE Confidence: 0.9588717

00:22:54.529 --> 00:22:55.490 and bad news. The good

NOTE Confidence: 0.9588717

00:22:55.490 --> 00:22:56.529 news is that we've come

NOTE Confidence: 0.9588717

00:22:56.529 --> 00:22:57.409 a long way in twenty

NOTE Confidence: 0.9588717

00:22:57.409 --> 00:22:58.635 three years. The bad news

NOTE Confidence: 0.9588717

00:22:58.635 --> 00:22:59.435 is we have a still

NOTE Confidence: 0.9588717

00:22:59.435 --> 00:23:00.395 a long way to go.

NOTE Confidence: 0.9588717

00:23:00.395 --> 00:23:01.675 And I often will say

NOTE Confidence: 0.9588717

00:23:01.675 --> 00:23:03.275 that my I'd skip over

NOTE Confidence: 0.9588717

00:23:03.275 --> 00:23:05.035 my children and grandchildren and

NOTE Confidence: 0.9588717

00:23:05.035 --> 00:23:06.234 great grandchildren. You'll all still

NOTE Confidence: 0.9588717

00:23:06.234 --> 00:23:07.595 be interpreting the three billion

NOTE Confidence: 0.9588717

00:23:07.595 --> 00:23:09.055 letters. This is a multigenerational

NOTE Confidence: 0.93359375

00:23:09.675 --> 00:23:10.170 challenge,

NOTE Confidence: 0.9778784

00:23:10.490 --> 00:23:11.210 but we have all the

NOTE Confidence: 0.9778784

00:23:11.210 --> 00:23:12.170 tools in front of us.

NOTE Confidence: 0.9778784

00:23:12.170 --> 00:23:13.530 Technologies are coming on board.

NOTE Confidence: 0.9778784

00:23:13.530 --> 00:23:14.410 We'll get better all the

NOTE Confidence: 0.9778784

00:23:14.410 --> 00:23:15.770 time. And we have a

NOTE Confidence: 0.9778784

00:23:15.850 --> 00:23:17.290 we've learned a lot about

NOTE Confidence: 0.9778784

00:23:17.290 --> 00:23:19.690 genomic variation, genome function, and,

NOTE Confidence: 0.9778784

00:23:19.690 --> 00:23:20.570 of course, what did that

NOTE Confidence: 0.9778784

00:23:20.570 --> 00:23:21.770 lead us to? Well, as

NOTE Confidence: 0.9778784

00:23:21.770 --> 00:23:23.210 as as people interested in

NOTE Confidence: 0.9778784

00:23:23.210 --> 00:23:24.970 human biology, human health and

NOTE Confidence: 0.9778784

00:23:24.970 --> 00:23:26.554 disease, it has significantly

NOTE Confidence: 0.99738103

00:23:26.934 --> 00:23:28.375 advanced our ability to understand

NOTE Confidence: 0.99738103

00:23:28.375 --> 00:23:29.815 the genomic basis of human

NOTE Confidence: 0.99738103

00:23:29.815 --> 00:23:30.315 disease.

NOTE Confidence: 0.9735038

00:23:30.695 --> 00:23:32.135 This has come about most

NOTE Confidence: 0.9735038

00:23:32.135 --> 00:23:34.455 fruitfully with rare genetic diseases,

NOTE Confidence: 0.9735038

00:23:34.455 --> 00:23:35.294 which I'm gonna tell you

NOTE Confidence: 0.9735038

00:23:35.294 --> 00:23:36.375 a little bit more about,

NOTE Confidence: 0.9735038

00:23:36.375 --> 00:23:37.975 but increasingly we're learning about

NOTE Confidence: 0.9735038

00:23:37.975 --> 00:23:39.414 the complexity of more common

NOTE Confidence: 0.9735038

00:23:39.414 --> 00:23:41.600 diseases and where multiple genomic

NOTE Confidence: 0.9735038

00:23:41.600 --> 00:23:43.519 variants are involved, greater contribution

NOTE Confidence: 0.9735038

00:23:43.519 --> 00:23:44.480 of the physical and social

NOTE Confidence: 0.9735038

00:23:44.480 --> 00:23:46.000 environment are involved, and so

NOTE Confidence: 0.9735038

00:23:46.000 --> 00:23:47.700 forth. But significant

NOTE Confidence: 0.97680664

00:23:48.080 --> 00:23:49.380 work has been accomplished.

NOTE Confidence: 0.9607239

00:23:49.760 --> 00:23:50.880 Lots more work has to

NOTE Confidence: 0.9607239

00:23:50.880 --> 00:23:52.200 be done to fully gain

NOTE Confidence: 0.9607239

00:23:52.200 --> 00:23:53.700 gain a a full understanding

NOTE Confidence: 0.9607239

00:23:53.760 --> 00:23:54.880 of the genomic basis of

NOTE Confidence: 0.9607239

00:23:54.880 --> 00:23:56.155 human disease. But But still,

NOTE Confidence: 0.9607239

00:23:56.155 --> 00:23:57.115 we're on a good glide

NOTE Confidence: 0.9607239

00:23:57.115 --> 00:23:58.635 path, and better technologies will

NOTE Confidence: 0.9607239

00:23:58.635 --> 00:23:59.855 improve it all the time.

NOTE Confidence: 0.97919923

00:24:00.315 --> 00:24:01.515 What I really wanted to

NOTE Confidence: 0.97919923

00:24:01.515 --> 00:24:02.635 emphasize, though, which is where

NOTE Confidence: 0.97919923

00:24:02.635 --> 00:24:04.175 I'm gonna pivot now to,

NOTE Confidence: 0.9867138

00:24:04.955 --> 00:24:06.315 is the fact that, you

NOTE Confidence: 0.9867138

00:24:06.315 --> 00:24:07.195 know, even if you go

NOTE Confidence: 0.9867138

00:24:07.195 --> 00:24:08.635 back sixteen years ago or

NOTE Confidence: 0.9867138

00:24:08.635 --> 00:24:09.755 something when I first became

NOTE Confidence: 0.9867138

00:24:09.755 --> 00:24:11.055 the NHGRI director,

NOTE Confidence: 0.9719434

00:24:11.380 --> 00:24:13.220 we really didn't have examples

NOTE Confidence: 0.9719434

00:24:13.220 --> 00:24:14.820 of genomic medicine that were

NOTE Confidence: 0.9719434

00:24:14.820 --> 00:24:16.340 truly being implemented at any

NOTE Confidence: 0.9719434

00:24:16.340 --> 00:24:18.100 sort of scale, and that

NOTE Confidence: 0.9719434

00:24:18.100 --> 00:24:19.480 just is not true anymore.

NOTE Confidence: 0.9984538

00:24:19.859 --> 00:24:21.460 It really has we've really

NOTE Confidence: 0.9984538

00:24:21.460 --> 00:24:21.960 seen

NOTE Confidence: 0.95832545

00:24:22.340 --> 00:24:24.415 some vivid examples emerge that

NOTE Confidence: 0.95832545

00:24:24.415 --> 00:24:25.615 I think is really, really

NOTE Confidence: 0.95832545

00:24:25.615 --> 00:24:26.655 exciting and I think has

NOTE Confidence: 0.95832545

00:24:26.655 --> 00:24:27.955 injected a lot of optimism

NOTE Confidence: 0.95832545

00:24:28.015 --> 00:24:29.135 about what still is left

NOTE Confidence: 0.95832545

00:24:29.135 --> 00:24:30.255 to come. How has this

NOTE Confidence: 0.95832545

00:24:30.255 --> 00:24:31.295 come about? Well, it's come

NOTE Confidence: 0.95832545

00:24:31.295 --> 00:24:32.335 about because of all things

NOTE Confidence: 0.95832545

00:24:32.335 --> 00:24:33.535 I sort of mentioned. We

NOTE Confidence: 0.95832545

00:24:33.535 --> 00:24:34.895 can now sequence a patient's

NOTE Confidence: 0.95832545

00:24:34.895 --> 00:24:35.855 genome for less than a

NOTE Confidence: 0.95832545

00:24:35.855 --> 00:24:37.055 thousand dollars. We can compare

NOTE Confidence: 0.95832545

00:24:37.055 --> 00:24:38.275 it to a reference sequence.

NOTE Confidence: 0.95832545

00:24:38.480 --> 00:24:39.359 We can make a big

NOTE Confidence: 0.95832545

00:24:39.359 --> 00:24:40.720 list of all the genomic

NOTE Confidence: 0.95832545

00:24:40.720 --> 00:24:42.359 variants that person has, got

NOTE Confidence: 0.95832545

00:24:42.480 --> 00:24:43.680 put out a DNA report,

NOTE Confidence: 0.95832545

00:24:43.680 --> 00:24:44.480 and off we go to

NOTE Confidence: 0.95832545

00:24:44.480 --> 00:24:45.780 practice genomic medicine.

NOTE Confidence: 0.9971349

00:24:46.080 --> 00:24:47.619 Now I know there's clinicians

NOTE Confidence: 0.9971349

00:24:47.680 --> 00:24:48.800 and others in the audience

NOTE Confidence: 0.9971349

00:24:48.800 --> 00:24:49.760 that know that this is

NOTE Confidence: 0.9971349

00:24:49.760 --> 00:24:50.500 an oversimplification.

NOTE Confidence: 0.9758708

00:24:51.040 --> 00:24:52.080 I will admit that. I'll

NOTE Confidence: 0.9758708

00:24:52.080 --> 00:24:52.960 come back to the slide

NOTE Confidence: 0.9758708

00:24:52.960 --> 00:24:54.100 later. But

NOTE Confidence: 0.9655954

00:24:54.505 --> 00:24:56.265 sometimes this works. It does

NOTE Confidence: 0.9655954

00:24:56.424 --> 00:24:57.945 and and and the sometimes

NOTE Confidence: 0.9655954

00:24:57.945 --> 00:24:59.625 is enough times to make

NOTE Confidence: 0.9655954

00:24:59.625 --> 00:25:01.225 it really impressive of predicting

NOTE Confidence: 0.9655954

00:25:01.225 --> 00:25:02.345 where we're gonna be as

NOTE Confidence: 0.9655954

00:25:02.345 --> 00:25:03.304 we get better and better

NOTE Confidence: 0.9655954

00:25:03.304 --> 00:25:05.065 at this. But even this

NOTE Confidence: 0.9655954

00:25:05.065 --> 00:25:06.684 cursory simple scheme

NOTE Confidence: 0.99105555

00:25:06.984 --> 00:25:08.184 has allowed us to move

NOTE Confidence: 0.99105555

00:25:08.184 --> 00:25:09.359 forward and come up with

NOTE Confidence: 0.99105555

00:25:09.440 --> 00:25:10.240 what I think are at

NOTE Confidence: 0.99105555

00:25:10.240 --> 00:25:12.080 least five areas where genomic

NOTE Confidence: 0.99105555

00:25:12.080 --> 00:25:13.540 medicine is here and now.

NOTE Confidence: 0.99105555

00:25:13.600 --> 00:25:14.720 And so this is sort

NOTE Confidence: 0.99105555

00:25:14.720 --> 00:25:15.619 of my examples,

NOTE Confidence: 0.96106493

00:25:16.160 --> 00:25:17.040 and I'm only I'm gonna

NOTE Confidence: 0.96106493

00:25:17.040 --> 00:25:17.840 dig a little deeper to

NOTE Confidence: 0.96106493

00:25:17.840 --> 00:25:18.799 some of them than others

NOTE Confidence: 0.96106493

00:25:18.799 --> 00:25:19.760 because I don't have time

NOTE Confidence: 0.96106493

00:25:19.760 --> 00:25:20.400 to dig in all of

NOTE Confidence: 0.96106493

00:25:20.400 --> 00:25:21.440 them, but so I cherry

NOTE Confidence: 0.96106493

00:25:21.440 --> 00:25:22.965 picked. The first of which

NOTE Confidence: 0.96106493

00:25:22.965 --> 00:25:24.005 is I'm just gonna give

NOTE Confidence: 0.96106493

00:25:24.005 --> 00:25:24.885 a shout out to Del

NOTE Confidence: 0.96106493

00:25:24.885 --> 00:25:26.645 Becco and just say he

NOTE Confidence: 0.96106493

00:25:26.645 --> 00:25:28.165 was right. He was absolutely

NOTE Confidence: 0.96106493

00:25:28.165 --> 00:25:29.365 right. I am looking at

NOTE Confidence: 0.96106493

00:25:29.365 --> 00:25:30.005 the well, I know in

NOTE Confidence: 0.96106493

00:25:30.005 --> 00:25:31.045 the audience are people that

NOTE Confidence: 0.96106493

00:25:31.045 --> 00:25:32.165 are far smarter than me

NOTE Confidence: 0.96106493

00:25:32.165 --> 00:25:33.685 in cancer genomics, so I

NOTE Confidence: 0.96106493

00:25:33.685 --> 00:25:34.885 won't even talk anymore about

NOTE Confidence: 0.96106493

00:25:34.885 --> 00:25:36.840 cancer genomics except to say

NOTE Confidence: 0.96106493

00:25:36.840 --> 00:25:37.340 that

NOTE Confidence: 0.9563802

00:25:37.799 --> 00:25:39.159 I believe that in the

NOTE Confidence: 0.9563802

00:25:39.159 --> 00:25:41.240 long run, the greatest area

NOTE Confidence: 0.9563802

00:25:41.240 --> 00:25:41.980 of impact

NOTE Confidence: 0.9970703

00:25:42.440 --> 00:25:43.820 across all of medicine

NOTE Confidence: 0.9567284

00:25:44.119 --> 00:25:45.400 in the long run with

NOTE Confidence: 0.9567284

00:25:45.400 --> 00:25:46.679 respect to genomics is gonna

NOTE Confidence: 0.9567284

00:25:46.679 --> 00:25:47.480 be in the cancer realm.

NOTE Confidence: 0.9567284

00:25:47.480 --> 00:25:48.359 Cancer is a disease of

NOTE Confidence: 0.9567284

00:25:48.359 --> 00:25:49.480 the genome. I think by

NOTE Confidence: 0.9567284

00:25:49.480 --> 00:25:50.440 the time we figure this

NOTE Confidence: 0.9567284

00:25:50.440 --> 00:25:51.545 all out, we're gonna have

NOTE Confidence: 0.9567284

00:25:51.545 --> 00:25:52.825 incredible stories to tell. We

NOTE Confidence: 0.9567284

00:25:52.825 --> 00:25:54.105 already have some pretty incredible

NOTE Confidence: 0.9567284

00:25:54.105 --> 00:25:55.385 stories. I would contend, in

NOTE Confidence: 0.9567284

00:25:55.385 --> 00:25:56.585 the last twenty three years,

NOTE Confidence: 0.9567284

00:25:56.585 --> 00:25:57.625 a lot of aspects of

NOTE Confidence: 0.9567284

00:25:57.625 --> 00:25:59.565 clinic of cancer research, oncology

NOTE Confidence: 0.9567284

00:25:59.705 --> 00:26:01.405 practice has been greatly influenced

NOTE Confidence: 0.9567284

00:26:01.545 --> 00:26:02.205 by genomics,

NOTE Confidence: 0.9420833

00:26:02.585 --> 00:26:03.785 and and and therefore is

NOTE Confidence: 0.9420833

00:26:03.785 --> 00:26:05.145 why I conclude DelBacco was

NOTE Confidence: 0.9420833

00:26:05.145 --> 00:26:06.760 simply right. I thought I'd

NOTE Confidence: 0.9420833

00:26:06.760 --> 00:26:07.880 go a little bit more

NOTE Confidence: 0.9420833

00:26:07.880 --> 00:26:10.059 into rare genetic disease diagnostics,

NOTE Confidence: 0.974528

00:26:10.840 --> 00:26:11.960 because I think there there's

NOTE Confidence: 0.974528

00:26:11.960 --> 00:26:13.240 something that maybe people don't

NOTE Confidence: 0.974528

00:26:13.240 --> 00:26:14.520 fully appreciate, and I really

NOTE Confidence: 0.974528

00:26:14.520 --> 00:26:15.720 wanna make sure you can

NOTE Confidence: 0.974528

00:26:15.720 --> 00:26:16.920 see where some of the

NOTE Confidence: 0.974528

00:26:16.920 --> 00:26:18.780 early successes have really come.

NOTE Confidence: 0.9794922

00:26:19.595 --> 00:26:20.955 In order to fully appreciate

NOTE Confidence: 0.9794922

00:26:20.955 --> 00:26:21.835 it, though, I wanna take

NOTE Confidence: 0.9794922

00:26:21.835 --> 00:26:23.355 you back in time. So

NOTE Confidence: 0.9794922

00:26:23.355 --> 00:26:25.115 remember, rare genetic diseases are

NOTE Confidence: 0.9794922

00:26:25.115 --> 00:26:25.615 diseases

NOTE Confidence: 0.99667966

00:26:26.234 --> 00:26:28.075 where it's almost always a

NOTE Confidence: 0.99667966

00:26:28.075 --> 00:26:29.535 single gene that is broken

NOTE Confidence: 0.91621095

00:26:29.835 --> 00:26:31.195 that leads with a high

NOTE Confidence: 0.91621095

00:26:31.195 --> 00:26:32.895 likelihood of leading to disease,

NOTE Confidence: 0.9567464

00:26:33.275 --> 00:26:34.250 you know. And but if

NOTE Confidence: 0.9567464

00:26:34.250 --> 00:26:35.130 I wanna take and and

NOTE Confidence: 0.9567464

00:26:35.130 --> 00:26:36.570 it's thought that there's something

NOTE Confidence: 0.9567464

00:26:36.570 --> 00:26:38.190 like ten thousand,

NOTE Confidence: 0.9938965

00:26:38.570 --> 00:26:39.869 rare genetic diseases.

NOTE Confidence: 0.9764557

00:26:40.490 --> 00:26:42.110 By the way, they're individually

NOTE Confidence: 0.9764557

00:26:42.250 --> 00:26:43.930 rare, but, you know, one

NOTE Confidence: 0.9764557

00:26:43.930 --> 00:26:44.810 out of ten of us

NOTE Confidence: 0.9764557

00:26:44.810 --> 00:26:46.250 in this room probably have

NOTE Confidence: 0.9764557

00:26:46.250 --> 00:26:47.369 a rare genetic disease. So

NOTE Confidence: 0.9764557

00:26:47.369 --> 00:26:48.090 I don't know what that

NOTE Confidence: 0.9764557

00:26:48.090 --> 00:26:48.810 number would be. There might

NOTE Confidence: 0.9764557

00:26:48.890 --> 00:26:49.610 you know, there may be

NOTE Confidence: 0.9764557

00:26:49.610 --> 00:26:50.385 ten or fifteen of us

NOTE Confidence: 0.9764557

00:26:50.385 --> 00:26:51.465 in this room who have

NOTE Confidence: 0.9764557

00:26:51.465 --> 00:26:53.185 a rare genetic disease. There's

NOTE Confidence: 0.9764557

00:26:53.185 --> 00:26:54.785 thirty million people in America

NOTE Confidence: 0.9764557

00:26:54.785 --> 00:26:55.925 with a a known,

NOTE Confidence: 0.9446208

00:26:56.385 --> 00:26:57.984 rare a rare disease, eighty

NOTE Confidence: 0.9446208

00:26:57.984 --> 00:26:58.785 percent of which are thought

NOTE Confidence: 0.9446208

00:26:58.785 --> 00:26:59.825 to be genetic, and that

NOTE Confidence: 0.9446208

00:26:59.984 --> 00:27:01.105 if you do that worldwide,

NOTE Confidence: 0.9446208

00:27:01.105 --> 00:27:02.385 about three hundred million people

NOTE Confidence: 0.9446208

00:27:02.385 --> 00:27:03.265 on this earth have a

NOTE Confidence: 0.9446208

00:27:03.265 --> 00:27:04.325 rare genetic disease.

NOTE Confidence: 0.94958496

00:27:04.750 --> 00:27:05.470 But let me take you

NOTE Confidence: 0.94958496

00:27:05.470 --> 00:27:06.590 back in time. The day

NOTE Confidence: 0.94958496

00:27:06.590 --> 00:27:07.809 the human genome project

NOTE Confidence: 0.9619548

00:27:08.350 --> 00:27:10.669 started in October of nineteen

NOTE Confidence: 0.9619548

00:27:10.669 --> 00:27:11.169 ninety,

NOTE Confidence: 0.99886066

00:27:11.869 --> 00:27:13.470 there were sixty one rare

NOTE Confidence: 0.99886066

00:27:13.470 --> 00:27:13.970 diseases

NOTE Confidence: 0.9699559

00:27:14.350 --> 00:27:15.230 for which we knew what

NOTE Confidence: 0.9699559

00:27:15.230 --> 00:27:16.850 the mutated gene was. Classic

NOTE Confidence: 0.9699559

00:27:16.910 --> 00:27:18.794 example was sickle cell. Cystic

NOTE Confidence: 0.9699559

00:27:18.794 --> 00:27:19.994 fibrosis got in by a

NOTE Confidence: 0.9699559

00:27:19.994 --> 00:27:21.115 year under the wire, just

NOTE Confidence: 0.9699559

00:27:21.115 --> 00:27:23.034 barely. But sixty one out

NOTE Confidence: 0.9699559

00:27:23.034 --> 00:27:23.934 of ten thousand.

NOTE Confidence: 0.976671

00:27:24.315 --> 00:27:26.234 But now with cheap methods

NOTE Confidence: 0.976671

00:27:26.234 --> 00:27:28.315 for sequencing DNA, understanding about

NOTE Confidence: 0.976671

00:27:28.315 --> 00:27:30.734 genomic variation, increasing understanding about

NOTE Confidence: 0.976671

00:27:30.910 --> 00:27:31.970 the genome function,

NOTE Confidence: 0.97202146

00:27:32.270 --> 00:27:34.030 and major programs to try

NOTE Confidence: 0.97202146

00:27:34.030 --> 00:27:35.730 to get at the remaining

NOTE Confidence: 0.97202146

00:27:35.790 --> 00:27:37.170 tenth of the ten thousand,

NOTE Confidence: 0.96086425

00:27:37.550 --> 00:27:39.390 we have made tremendous strides.

NOTE Confidence: 0.96086425

00:27:39.390 --> 00:27:41.070 We're over six thousand. Still

NOTE Confidence: 0.96086425

00:27:41.070 --> 00:27:42.030 shy of ten thousand, but

NOTE Confidence: 0.96086425

00:27:42.030 --> 00:27:43.150 we're over six we've gone

NOTE Confidence: 0.96086425

00:27:43.150 --> 00:27:44.835 from sixty one to six

NOTE Confidence: 0.96086425

00:27:44.835 --> 00:27:46.275 thousand. And that has just

NOTE Confidence: 0.96086425

00:27:46.275 --> 00:27:48.115 been unbelievably game changing for

NOTE Confidence: 0.96086425

00:27:48.115 --> 00:27:49.635 lots of families and game

NOTE Confidence: 0.96086425

00:27:49.635 --> 00:27:50.994 changing with regard to understanding

NOTE Confidence: 0.96086425

00:27:50.994 --> 00:27:52.115 the genomic basis of a

NOTE Confidence: 0.96086425

00:27:52.115 --> 00:27:53.494 lot of rare genetic diseases.

NOTE Confidence: 0.97314453

00:27:54.035 --> 00:27:55.015 What this means,

NOTE Confidence: 0.93720704

00:27:55.395 --> 00:27:56.755 it is it is now

NOTE Confidence: 0.93720704

00:27:56.755 --> 00:27:57.955 routine, and I'm sure it

NOTE Confidence: 0.93720704

00:27:57.955 --> 00:27:59.380 is taking place here in

NOTE Confidence: 0.93720704

00:27:59.380 --> 00:28:01.780 pediatrics department in particular where

NOTE Confidence: 0.93720704

00:28:01.780 --> 00:28:02.900 a patient will come in

NOTE Confidence: 0.93720704

00:28:02.900 --> 00:28:04.520 with something like a developmental

NOTE Confidence: 0.93720704

00:28:04.659 --> 00:28:06.440 delay or a cardiac abnormality.

NOTE Confidence: 0.95382905

00:28:06.820 --> 00:28:07.859 And, yes, they will get

NOTE Confidence: 0.95382905

00:28:07.859 --> 00:28:09.700 a traditional clinical workup, but

NOTE Confidence: 0.95382905

00:28:09.700 --> 00:28:11.299 very early on, that clinician

NOTE Confidence: 0.95382905

00:28:11.299 --> 00:28:12.900 suspects a genetic disease, a

NOTE Confidence: 0.95382905

00:28:12.900 --> 00:28:14.115 tube of blood goes off,

NOTE Confidence: 0.95382905

00:28:14.195 --> 00:28:15.395 they will sequence that patient's

NOTE Confidence: 0.95382905

00:28:15.395 --> 00:28:16.515 genome. It'll cost less than

NOTE Confidence: 0.95382905

00:28:16.515 --> 00:28:17.875 a thousand dollars. Maybe they'll

NOTE Confidence: 0.95382905

00:28:17.875 --> 00:28:19.635 even sequence both patient parents'

NOTE Confidence: 0.95382905

00:28:19.635 --> 00:28:20.915 genomes. They will come out

NOTE Confidence: 0.95382905

00:28:20.915 --> 00:28:22.275 with a report, and they

NOTE Confidence: 0.95382905

00:28:22.275 --> 00:28:23.715 will quite frequently come up

NOTE Confidence: 0.95382905

00:28:23.715 --> 00:28:24.535 with a diagnosis.

NOTE Confidence: 0.95245916

00:28:25.315 --> 00:28:26.355 All as quick as you

NOTE Confidence: 0.95245916

00:28:26.355 --> 00:28:27.635 could imagine compared to a

NOTE Confidence: 0.95245916

00:28:27.635 --> 00:28:28.135 long

NOTE Confidence: 0.9613265

00:28:28.549 --> 00:28:30.150 Odyssey that typically would be,

NOTE Confidence: 0.9613265

00:28:30.390 --> 00:28:31.830 seen with those many patients

NOTE Confidence: 0.9613265

00:28:31.830 --> 00:28:33.750 with rare genetic diseases. What's

NOTE Confidence: 0.9613265

00:28:33.750 --> 00:28:34.950 the frequency of it? There's

NOTE Confidence: 0.9613265

00:28:34.950 --> 00:28:35.990 lots of articles I could

NOTE Confidence: 0.9613265

00:28:35.990 --> 00:28:37.030 point you to. This just

NOTE Confidence: 0.9613265

00:28:37.030 --> 00:28:38.230 happens to be one that

NOTE Confidence: 0.9613265

00:28:38.230 --> 00:28:39.429 I will where they talk

NOTE Confidence: 0.9613265

00:28:39.429 --> 00:28:40.470 about how the yield, at

NOTE Confidence: 0.9613265

00:28:40.470 --> 00:28:41.350 least in the hands of

NOTE Confidence: 0.9613265

00:28:41.350 --> 00:28:42.390 the people involved in this,

NOTE Confidence: 0.9613265

00:28:42.390 --> 00:28:43.610 is about fifty percent.

NOTE Confidence: 0.94740516

00:28:43.955 --> 00:28:44.995 Just, you know, thirty to

NOTE Confidence: 0.94740516

00:28:44.995 --> 00:28:45.735 fifty percent.

NOTE Confidence: 0.99588716

00:28:46.115 --> 00:28:47.395 And and but this never

NOTE Confidence: 0.99588716

00:28:47.395 --> 00:28:48.915 will increase over time for

NOTE Confidence: 0.99588716

00:28:48.915 --> 00:28:49.815 lots of reasons,

NOTE Confidence: 0.9394156

00:28:50.675 --> 00:28:51.795 including the fact that the

NOTE Confidence: 0.9394156

00:28:51.795 --> 00:28:52.995 better we get at interpreting

NOTE Confidence: 0.9394156

00:28:52.995 --> 00:28:53.955 the human genome and the

NOTE Confidence: 0.9394156

00:28:53.955 --> 00:28:55.175 better we get at understanding

NOTE Confidence: 0.9394156

00:28:55.235 --> 00:28:56.675 how the variance influence genome

NOTE Confidence: 0.9394156

00:28:56.675 --> 00:28:57.175 function,

NOTE Confidence: 0.97058105

00:28:57.529 --> 00:28:58.330 we're gonna get better and

NOTE Confidence: 0.97058105

00:28:58.330 --> 00:28:59.210 better at this. And there's

NOTE Confidence: 0.97058105

00:28:59.210 --> 00:29:00.330 other reasons to believe we're

NOTE Confidence: 0.97058105

00:29:00.330 --> 00:29:01.210 only gonna get better and

NOTE Confidence: 0.97058105

00:29:01.210 --> 00:29:02.570 better at this. And what's

NOTE Confidence: 0.97058105

00:29:02.570 --> 00:29:04.490 really gratifying, especially for someone

NOTE Confidence: 0.97058105

00:29:04.490 --> 00:29:05.929 like me who's always worried

NOTE Confidence: 0.97058105

00:29:05.929 --> 00:29:07.149 about would this get implemented,

NOTE Confidence: 0.97058105

00:29:07.210 --> 00:29:08.269 would this get implemented,

NOTE Confidence: 0.9713325

00:29:08.809 --> 00:29:09.769 now we start to see

NOTE Confidence: 0.9713325

00:29:09.769 --> 00:29:11.850 review articles that talk about

NOTE Confidence: 0.9713325

00:29:11.850 --> 00:29:13.304 how this is the state

NOTE Confidence: 0.9713325

00:29:13.304 --> 00:29:15.385 of implementation across dozens and

NOTE Confidence: 0.9713325

00:29:15.385 --> 00:29:16.985 dozens of studies where genome

NOTE Confidence: 0.9713325

00:29:16.985 --> 00:29:18.184 sequencing is being used as

NOTE Confidence: 0.9713325

00:29:18.184 --> 00:29:20.105 a frontline diagnostic tool in

NOTE Confidence: 0.9713325

00:29:20.105 --> 00:29:21.705 the for working up working

NOTE Confidence: 0.9713325

00:29:21.705 --> 00:29:23.164 up patients with rare diseases.

NOTE Confidence: 0.98350304

00:29:23.544 --> 00:29:24.664 And so we are absolutely

NOTE Confidence: 0.98350304

00:29:24.664 --> 00:29:25.405 seeing this,

NOTE Confidence: 0.97010154

00:29:25.865 --> 00:29:26.970 play out over and over

NOTE Confidence: 0.97010154

00:29:26.970 --> 00:29:28.010 again. In fact, it's it's,

NOTE Confidence: 0.97010154

00:29:28.010 --> 00:29:29.450 you know, thousands and thousands

NOTE Confidence: 0.97010154

00:29:29.450 --> 00:29:30.970 of times every single month

NOTE Confidence: 0.97010154

00:29:30.970 --> 00:29:32.170 around the world. Patients with

NOTE Confidence: 0.97010154

00:29:32.170 --> 00:29:34.190 rare diseases are getting, diagnosed

NOTE Confidence: 0.97010154

00:29:34.250 --> 00:29:35.690 using genome sequencing as a

NOTE Confidence: 0.97010154

00:29:35.690 --> 00:29:37.690 frontline tool. There are also

NOTE Confidence: 0.97010154

00:29:37.690 --> 00:29:39.050 some niche areas that I

NOTE Confidence: 0.97010154

00:29:39.050 --> 00:29:40.429 wanted to point out. One

NOTE Confidence: 0.97010154

00:29:40.570 --> 00:29:41.070 is

NOTE Confidence: 0.9134607

00:29:41.605 --> 00:29:43.445 is in the undiagnosed diseases

NOTE Confidence: 0.9134607

00:29:43.445 --> 00:29:44.485 space. You you should remember

NOTE Confidence: 0.9134607

00:29:44.565 --> 00:29:45.605 and I actually don't know,

NOTE Confidence: 0.9134607

00:29:45.605 --> 00:29:46.325 Dave, if you have this

NOTE Confidence: 0.9134607

00:29:46.325 --> 00:29:47.924 at at at Hopkins, but

NOTE Confidence: 0.9134607

00:29:47.924 --> 00:29:48.644 I know we have this

NOTE Confidence: 0.9134607

00:29:48.644 --> 00:29:50.404 at WashU that you you

NOTE Confidence: 0.9134607

00:29:50.485 --> 00:29:51.924 there'd be clinics at WashU.

NOTE Confidence: 0.9134607

00:29:51.924 --> 00:29:53.625 They'd call them Fasanoma clinics

NOTE Confidence: 0.9134607

00:29:53.924 --> 00:29:55.100 back then. And these and

NOTE Confidence: 0.9134607

00:29:55.100 --> 00:29:56.380 they definitely had them at

NOTE Confidence: 0.9134607

00:29:56.380 --> 00:29:58.160 NIH for years where basically,

NOTE Confidence: 0.9134607

00:29:58.380 --> 00:30:00.160 when there were patients, oftentimes

NOTE Confidence: 0.9134607

00:30:00.380 --> 00:30:01.280 into adulthood,

NOTE Confidence: 0.9554867

00:30:01.660 --> 00:30:02.540 where they had gone from

NOTE Confidence: 0.9554867

00:30:02.540 --> 00:30:04.000 specialist to specialist to specialist,

NOTE Confidence: 0.9554867

00:30:04.140 --> 00:30:05.180 nobody could figure out what's

NOTE Confidence: 0.9554867

00:30:05.180 --> 00:30:06.140 wrong with them. They would

NOTE Confidence: 0.9554867

00:30:06.140 --> 00:30:07.100 bring them to what's called

NOTE Confidence: 0.9554867

00:30:07.100 --> 00:30:08.665 a fascinoma clinic where they'd

NOTE Confidence: 0.9554867

00:30:08.665 --> 00:30:10.425 have multiple disciplines come and

NOTE Confidence: 0.9554867

00:30:10.425 --> 00:30:12.025 take one critical last look.

NOTE Confidence: 0.9554867

00:30:12.025 --> 00:30:12.905 Can we figure out what's

NOTE Confidence: 0.9554867

00:30:12.905 --> 00:30:13.965 wrong with this person?

NOTE Confidence: 0.94933265

00:30:14.265 --> 00:30:15.625 Now under the leadership of

NOTE Confidence: 0.94933265

00:30:15.625 --> 00:30:17.225 Bill Gall, when he when

NOTE Confidence: 0.94933265

00:30:17.225 --> 00:30:18.925 I were both, at NHGRI,

NOTE Confidence: 0.9506614

00:30:19.785 --> 00:30:20.665 and he's shown in the

NOTE Confidence: 0.9506614

00:30:20.665 --> 00:30:21.945 center, was our clinical director

NOTE Confidence: 0.9506614

00:30:21.945 --> 00:30:23.110 for many years, Came up

NOTE Confidence: 0.9506614

00:30:23.110 --> 00:30:24.250 with this idea of undiagnosed

NOTE Confidence: 0.9506614

00:30:24.390 --> 00:30:25.450 diseases programs

NOTE Confidence: 0.8209381

00:30:25.750 --> 00:30:26.710 and just called it that

NOTE Confidence: 0.8209381

00:30:26.710 --> 00:30:27.690 and in particular,

NOTE Confidence: 0.94550526

00:30:28.149 --> 00:30:29.510 used genomics as a frontline

NOTE Confidence: 0.94550526

00:30:29.510 --> 00:30:30.630 tool for sort of one

NOTE Confidence: 0.94550526

00:30:30.630 --> 00:30:31.750 last workup of a patient,

NOTE Confidence: 0.94550526

00:30:31.750 --> 00:30:33.049 but now using genomics.

NOTE Confidence: 0.9372339

00:30:33.510 --> 00:30:35.205 And this has now taken

NOTE Confidence: 0.9372339

00:30:35.205 --> 00:30:36.664 off. We're at an undiagnosed

NOTE Confidence: 0.9372339

00:30:36.725 --> 00:30:38.485 diseases network across the United

NOTE Confidence: 0.9372339

00:30:38.485 --> 00:30:40.325 States, and dozens and dozens

NOTE Confidence: 0.9372339

00:30:40.325 --> 00:30:41.865 of countries have now implemented

NOTE Confidence: 0.9372339

00:30:41.924 --> 00:30:43.845 undiagnosed diseases programs. They bring

NOTE Confidence: 0.9372339

00:30:43.845 --> 00:30:45.285 them together, big clinical workup,

NOTE Confidence: 0.9372339

00:30:45.285 --> 00:30:46.184 genome sequencing,

NOTE Confidence: 0.9939528

00:30:46.485 --> 00:30:47.970 and this is now becoming

NOTE Confidence: 0.9939528

00:30:47.970 --> 00:30:49.250 sort of mainstream in a

NOTE Confidence: 0.9939528

00:30:49.250 --> 00:30:49.990 lot of places,

NOTE Confidence: 0.99609375

00:30:50.450 --> 00:30:51.510 and really has

NOTE Confidence: 0.5048828

00:30:51.890 --> 00:30:52.390 importantly

NOTE Confidence: 0.83251953

00:30:52.770 --> 00:30:53.750 given diagnoses

NOTE Confidence: 0.93600947

00:30:54.370 --> 00:30:55.650 to many people who for

NOTE Confidence: 0.93600947

00:30:55.650 --> 00:30:57.090 decades have gone on through

NOTE Confidence: 0.93600947

00:30:57.090 --> 00:30:58.450 life without knowing diagnosis. In

NOTE Confidence: 0.93600947

00:30:58.450 --> 00:30:59.410 some cases, it actually has

NOTE Confidence: 0.93600947

00:30:59.410 --> 00:31:00.885 changed their management. And it's

NOTE Confidence: 0.93600947

00:31:00.885 --> 00:31:01.925 been very important. It's also

NOTE Confidence: 0.93600947

00:31:01.925 --> 00:31:03.125 led to discovery of many

NOTE Confidence: 0.93600947

00:31:03.125 --> 00:31:04.745 new, genetic diseases.

NOTE Confidence: 0.9990826

00:31:05.845 --> 00:31:07.765 Another niche area is in

NOTE Confidence: 0.9990826

00:31:07.765 --> 00:31:09.125 the setting of acutely ill

NOTE Confidence: 0.9990826

00:31:09.125 --> 00:31:09.625 newborns.

NOTE Confidence: 0.96935797

00:31:10.085 --> 00:31:11.845 In the setting of, of

NOTE Confidence: 0.96935797

00:31:11.845 --> 00:31:13.765 any given NICU, neonatal intensive

NOTE Confidence: 0.96935797

00:31:13.765 --> 00:31:14.965 care unit, you will often

NOTE Confidence: 0.96935797

00:31:14.965 --> 00:31:15.865 have babies

NOTE Confidence: 0.978597

00:31:16.750 --> 00:31:17.870 where you have stumped the

NOTE Confidence: 0.978597

00:31:17.870 --> 00:31:18.370 neonatologist,

NOTE Confidence: 0.9354209

00:31:18.910 --> 00:31:19.950 and they simply have no

NOTE Confidence: 0.9354209

00:31:19.950 --> 00:31:20.990 idea what is going on.

NOTE Confidence: 0.9354209

00:31:20.990 --> 00:31:22.030 In many cases, they can

NOTE Confidence: 0.9354209

00:31:22.030 --> 00:31:23.390 predict that the child probably

NOTE Confidence: 0.9354209

00:31:23.390 --> 00:31:24.430 has a few days before

NOTE Confidence: 0.9354209

00:31:24.430 --> 00:31:25.550 the they their child will

NOTE Confidence: 0.9354209

00:31:25.550 --> 00:31:26.050 expire.

NOTE Confidence: 0.93638283

00:31:26.430 --> 00:31:27.790 Well, through a program that

NOTE Confidence: 0.93638283

00:31:27.790 --> 00:31:29.090 I helped launch and NHGRI

NOTE Confidence: 0.93638283

00:31:29.150 --> 00:31:30.610 funded that has now become

NOTE Confidence: 0.93638283

00:31:30.784 --> 00:31:31.985 sort of now standard in

NOTE Confidence: 0.93638283

00:31:31.985 --> 00:31:32.804 many places

NOTE Confidence: 0.9571499

00:31:33.105 --> 00:31:34.065 is the idea when you

NOTE Confidence: 0.9571499

00:31:34.065 --> 00:31:34.865 have a patient like that

NOTE Confidence: 0.9571499

00:31:34.865 --> 00:31:35.985 in NICU, don't just get

NOTE Confidence: 0.9571499

00:31:35.985 --> 00:31:37.424 a genome sequence. Get it

NOTE Confidence: 0.9571499

00:31:37.424 --> 00:31:39.265 fast. And so technologies and

NOTE Confidence: 0.9571499

00:31:39.265 --> 00:31:41.044 approaches have been now implemented

NOTE Confidence: 0.9571499

00:31:41.105 --> 00:31:41.825 to be able to get

NOTE Confidence: 0.9571499

00:31:41.825 --> 00:31:43.505 a very rapid genome sequence.

NOTE Confidence: 0.9571499

00:31:43.505 --> 00:31:44.820 And in about thirty to

NOTE Confidence: 0.9571499

00:31:44.820 --> 00:31:45.620 fifty percent of the time,

NOTE Confidence: 0.9571499

00:31:45.620 --> 00:31:46.740 you get a diagnosis. And

NOTE Confidence: 0.9571499

00:31:46.740 --> 00:31:47.860 in many cases, it changes

NOTE Confidence: 0.9571499

00:31:47.860 --> 00:31:48.740 the management. You get the

NOTE Confidence: 0.9571499

00:31:48.740 --> 00:31:50.020 kids the patient out of

NOTE Confidence: 0.9571499

00:31:50.020 --> 00:31:51.400 the NICU into a specialist

NOTE Confidence: 0.9571499

00:31:51.460 --> 00:31:52.900 care, and it has saved

NOTE Confidence: 0.9571499

00:31:52.900 --> 00:31:54.659 lives and has resulted in,

NOTE Confidence: 0.9770101

00:31:55.539 --> 00:31:56.419 a savings of a lot

NOTE Confidence: 0.9770101

00:31:56.419 --> 00:31:57.755 of money. And, again, what

NOTE Confidence: 0.9770101

00:31:57.755 --> 00:31:59.034 makes me really happy is

NOTE Confidence: 0.9770101

00:31:59.034 --> 00:32:00.075 to see the uptake of

NOTE Confidence: 0.9770101

00:32:00.075 --> 00:32:01.135 this in the NICU

NOTE Confidence: 0.8687744

00:32:01.595 --> 00:32:03.054 increasingly in the pediatric

NOTE Confidence: 0.96750146

00:32:03.434 --> 00:32:05.115 the PICU, the pediatric intensive

NOTE Confidence: 0.96750146

00:32:05.115 --> 00:32:07.034 care unit. And then they

NOTE Confidence: 0.96750146

00:32:07.034 --> 00:32:08.475 actually do review articles, which

NOTE Confidence: 0.96750146

00:32:08.475 --> 00:32:09.835 means its uptake is significant

NOTE Confidence: 0.96750146

00:32:09.835 --> 00:32:10.875 if they can actually study

NOTE Confidence: 0.96750146

00:32:10.875 --> 00:32:12.100 this. This was a review

NOTE Confidence: 0.96750146

00:32:12.100 --> 00:32:13.299 article from a couple years

NOTE Confidence: 0.96750146

00:32:13.299 --> 00:32:14.580 ago. And just read the

NOTE Confidence: 0.96750146

00:32:14.580 --> 00:32:16.260 first paragraph in particular. They

NOTE Confidence: 0.96750146

00:32:16.260 --> 00:32:17.880 looked at forty four studies

NOTE Confidence: 0.96750146

00:32:18.100 --> 00:32:19.140 where this was being done

NOTE Confidence: 0.96750146

00:32:19.140 --> 00:32:19.960 in ICUs

NOTE Confidence: 0.803418

00:32:20.340 --> 00:32:21.799 in with in the pediatric,

NOTE Confidence: 0.9238281

00:32:22.820 --> 00:32:23.320 area.

NOTE Confidence: 0.9348416

00:32:23.955 --> 00:32:25.475 And thirty seven percent of

NOTE Confidence: 0.9348416

00:32:25.475 --> 00:32:26.275 the time, they got a

NOTE Confidence: 0.9348416

00:32:26.275 --> 00:32:27.955 genetic diagnosis, and twenty six

NOTE Confidence: 0.9348416

00:32:27.955 --> 00:32:29.554 percent had consequent changes in

NOTE Confidence: 0.9348416

00:32:29.554 --> 00:32:31.395 management leading to net health

NOTE Confidence: 0.9348416

00:32:31.395 --> 00:32:32.054 care costs,

NOTE Confidence: 0.8883464

00:32:32.434 --> 00:32:33.895 reduction or savings.

NOTE Confidence: 0.976137

00:32:34.355 --> 00:32:35.395 The point is every one

NOTE Confidence: 0.976137

00:32:35.395 --> 00:32:36.434 of these numbers will get

NOTE Confidence: 0.976137

00:32:36.434 --> 00:32:37.670 better because we'll get better

NOTE Confidence: 0.976137

00:32:37.670 --> 00:32:38.870 at interpreting the data, better

NOTE Confidence: 0.976137

00:32:38.870 --> 00:32:40.470 understanding about the genetic basis

NOTE Confidence: 0.976137

00:32:40.470 --> 00:32:41.590 of rare diseases and so

NOTE Confidence: 0.976137

00:32:41.590 --> 00:32:43.610 forth, which gives great optimism,

NOTE Confidence: 0.93795574

00:32:44.150 --> 00:32:45.670 exactly why this is now

NOTE Confidence: 0.93795574

00:32:45.670 --> 00:32:47.030 being implemented more and more

NOTE Confidence: 0.93795574

00:32:47.030 --> 00:32:49.050 in pediatric intensive care units.

NOTE Confidence: 0.9729693

00:32:49.705 --> 00:32:51.625 I was particularly impressed at

NOTE Confidence: 0.9729693

00:32:51.625 --> 00:32:53.065 this paper that I saw,

NOTE Confidence: 0.9729693

00:32:53.065 --> 00:32:54.024 because I always wonder, well,

NOTE Confidence: 0.9729693

00:32:54.024 --> 00:32:55.544 what about other intensive care

NOTE Confidence: 0.9729693

00:32:55.544 --> 00:32:57.304 units? And the people at

NOTE Confidence: 0.9729693

00:32:57.304 --> 00:32:58.825 Penn also thought about this.

NOTE Confidence: 0.9729693

00:32:58.825 --> 00:33:00.105 And last summer, they published

NOTE Confidence: 0.9729693

00:33:00.105 --> 00:33:01.065 this paper, which I thought

NOTE Confidence: 0.9729693

00:33:01.065 --> 00:33:02.320 is pretty cool, where they

NOTE Confidence: 0.9729693

00:33:02.320 --> 00:33:03.840 basically said, let's take a

NOTE Confidence: 0.9729693

00:33:03.840 --> 00:33:05.120 bunch of patients, hundreds of

NOTE Confidence: 0.9729693

00:33:05.120 --> 00:33:06.240 patients that came into the

NOTE Confidence: 0.9729693

00:33:06.240 --> 00:33:07.220 adult ICU.

NOTE Confidence: 0.9900716

00:33:07.680 --> 00:33:08.720 They ruled out they they

NOTE Confidence: 0.9900716

00:33:08.720 --> 00:33:10.000 excluded from the study those

NOTE Confidence: 0.9900716

00:33:10.000 --> 00:33:11.120 that were there for trauma

NOTE Confidence: 0.9900716

00:33:11.120 --> 00:33:12.260 or for poisoning

NOTE Confidence: 0.9484428

00:33:12.560 --> 00:33:14.080 or for, you know, known

NOTE Confidence: 0.9484428

00:33:14.080 --> 00:33:15.440 condition like cancer. They were

NOTE Confidence: 0.9484428

00:33:15.440 --> 00:33:16.880 having, you know, problems related

NOTE Confidence: 0.9484428

00:33:16.880 --> 00:33:18.684 to their treatment, leaving just

NOTE Confidence: 0.9484428

00:33:18.684 --> 00:33:19.645 a lot of patients that

NOTE Confidence: 0.9484428

00:33:19.645 --> 00:33:20.865 all of us know about

NOTE Confidence: 0.9484428

00:33:20.924 --> 00:33:22.284 that are just they're they're

NOTE Confidence: 0.9484428

00:33:22.284 --> 00:33:23.404 they're they're just fragile that

NOTE Confidence: 0.9484428

00:33:23.404 --> 00:33:24.605 they that you're surprised they

NOTE Confidence: 0.9484428

00:33:24.605 --> 00:33:25.245 have to be in the

NOTE Confidence: 0.9484428

00:33:25.245 --> 00:33:26.284 ICU, and they just end

NOTE Confidence: 0.9484428

00:33:26.284 --> 00:33:27.505 up landing in the ICU.

NOTE Confidence: 0.9484428

00:33:27.645 --> 00:33:29.085 And they're otherwise adult in

NOTE Confidence: 0.9484428

00:33:29.085 --> 00:33:30.524 some cases, being otherwise healthy

NOTE Confidence: 0.9484428

00:33:30.524 --> 00:33:31.725 until of a sudden onset

NOTE Confidence: 0.9484428

00:33:31.725 --> 00:33:33.000 of some symptoms that land

NOTE Confidence: 0.9484428

00:33:33.000 --> 00:33:33.940 them in the ICU.

NOTE Confidence: 0.94155276

00:33:34.320 --> 00:33:35.700 And they sequenced their genomes,

NOTE Confidence: 0.9993722

00:33:36.080 --> 00:33:36.880 and they found that a

NOTE Confidence: 0.9993722

00:33:36.880 --> 00:33:37.920 quarter of them had an

NOTE Confidence: 0.9993722

00:33:37.920 --> 00:33:39.780 undiagnosed rare genetic disease.

NOTE Confidence: 0.9894857

00:33:40.240 --> 00:33:41.680 So, again, that number will

NOTE Confidence: 0.9894857

00:33:41.680 --> 00:33:42.800 get bigger, but it also

NOTE Confidence: 0.9894857

00:33:42.800 --> 00:33:44.080 starts pointing to the fact

NOTE Confidence: 0.9894857

00:33:44.080 --> 00:33:46.000 that many people, including people

NOTE Confidence: 0.9894857

00:33:46.000 --> 00:33:46.800 who just seem to be

NOTE Confidence: 0.9894857

00:33:46.800 --> 00:33:48.745 fragile, have rare genetic diseases

NOTE Confidence: 0.9894857

00:33:48.745 --> 00:33:49.885 that are going on undiagnosed,

NOTE Confidence: 0.9894857

00:33:49.945 --> 00:33:50.745 and we're in a position

NOTE Confidence: 0.9894857

00:33:50.745 --> 00:33:51.865 now to increasingly be able

NOTE Confidence: 0.9894857

00:33:51.865 --> 00:33:52.925 to diagnose them.

NOTE Confidence: 0.9614374

00:33:53.785 --> 00:33:54.985 So I, you could tell

NOTE Confidence: 0.9614374

00:33:54.985 --> 00:33:56.425 I'm very enthusiastic about the

NOTE Confidence: 0.9614374

00:33:56.425 --> 00:33:57.785 progress in this area. And

NOTE Confidence: 0.9614374

00:33:57.785 --> 00:33:58.825 if you wanna read more,

NOTE Confidence: 0.9614374

00:33:58.825 --> 00:34:00.045 I would just point you

NOTE Confidence: 0.9614374

00:34:00.105 --> 00:34:01.920 to to two very short

NOTE Confidence: 0.9614374

00:34:01.920 --> 00:34:03.679 perspective pieces that came out

NOTE Confidence: 0.9614374

00:34:03.679 --> 00:34:04.640 just in the last few

NOTE Confidence: 0.9614374

00:34:04.640 --> 00:34:05.460 weeks, actually,

NOTE Confidence: 0.9789481

00:34:06.160 --> 00:34:07.440 in two different journals. And

NOTE Confidence: 0.9789481

00:34:07.440 --> 00:34:08.320 I would just point you

NOTE Confidence: 0.9789481

00:34:08.320 --> 00:34:09.520 to those because it really,

NOTE Confidence: 0.9789481

00:34:09.520 --> 00:34:11.040 I think, very nicely underscores

NOTE Confidence: 0.9789481

00:34:11.040 --> 00:34:12.080 the point that I am

NOTE Confidence: 0.9789481

00:34:12.080 --> 00:34:13.200 making. And I I just

NOTE Confidence: 0.9789481

00:34:13.200 --> 00:34:14.739 like the very last paragraph,

NOTE Confidence: 0.9509368

00:34:15.265 --> 00:34:16.545 what actually, Harry is a

NOTE Confidence: 0.9509368

00:34:16.545 --> 00:34:17.265 good friend of mine, and

NOTE Confidence: 0.9509368

00:34:17.265 --> 00:34:18.385 he wrote, I just thought

NOTE Confidence: 0.9509368

00:34:18.385 --> 00:34:19.585 so eloquently what he just

NOTE Confidence: 0.9509368

00:34:19.585 --> 00:34:21.844 said. As professional societies codify

NOTE Confidence: 0.9509368

00:34:21.985 --> 00:34:23.125 universal standards

NOTE Confidence: 0.9571533

00:34:23.425 --> 00:34:25.585 and laboratories deliver rapid variant

NOTE Confidence: 0.9571533

00:34:25.585 --> 00:34:28.244 specific insights, clinicians must transition

NOTE Confidence: 0.9571533

00:34:28.305 --> 00:34:29.045 from reactive

NOTE Confidence: 0.95224607

00:34:29.344 --> 00:34:32.000 watchful waiting to proactive phenotype

NOTE Confidence: 0.83618164

00:34:32.460 --> 00:34:34.239 and genotype informed management.

NOTE Confidence: 0.9747043

00:34:34.620 --> 00:34:35.900 In other words, when you

NOTE Confidence: 0.9747043

00:34:35.980 --> 00:34:36.940 don't just sit and watch

NOTE Confidence: 0.9747043

00:34:36.940 --> 00:34:37.900 a patient. Get the damn

NOTE Confidence: 0.9747043

00:34:37.900 --> 00:34:39.360 genotype. And increasingly,

NOTE Confidence: 0.96033585

00:34:39.739 --> 00:34:40.460 that's a heck of a

NOTE Confidence: 0.96033585

00:34:40.460 --> 00:34:41.340 lot cheaper than a lot

NOTE Confidence: 0.96033585

00:34:41.340 --> 00:34:42.380 of other things you're doing.

NOTE Confidence: 0.96033585

00:34:42.380 --> 00:34:43.114 And if you had all

NOTE Confidence: 0.96033585

00:34:43.114 --> 00:34:43.994 of the suspicion of a

NOTE Confidence: 0.96033585

00:34:43.994 --> 00:34:45.135 rare genetic disease,

NOTE Confidence: 0.9992676

00:34:45.515 --> 00:34:46.635 you should absolutely be doing

NOTE Confidence: 0.9992676

00:34:46.635 --> 00:34:47.135 that.

NOTE Confidence: 0.96952

00:34:47.915 --> 00:34:49.035 And part of the reason

NOTE Confidence: 0.96952

00:34:49.035 --> 00:34:50.555 I wanna point out that

NOTE Confidence: 0.96952

00:34:50.555 --> 00:34:51.755 I think it's only gonna

NOTE Confidence: 0.96952

00:34:51.755 --> 00:34:53.434 get better is I'm a

NOTE Confidence: 0.96952

00:34:53.434 --> 00:34:54.795 genomics guy, so I'm all

NOTE Confidence: 0.96952

00:34:54.795 --> 00:34:56.474 enthusiastic about changes in DNA

NOTE Confidence: 0.96952

00:34:56.474 --> 00:34:58.415 sequence. But I also realize

NOTE Confidence: 0.96952

00:34:58.610 --> 00:34:59.750 biology is more complicated,

NOTE Confidence: 0.99590385

00:35:00.450 --> 00:35:02.070 and there'll be other technologies

NOTE Confidence: 0.99590385

00:35:02.290 --> 00:35:04.210 that will deliver other types

NOTE Confidence: 0.99590385

00:35:04.210 --> 00:35:05.969 of data that will enhance

NOTE Confidence: 0.99590385

00:35:05.969 --> 00:35:06.930 what we are doing in

NOTE Confidence: 0.99590385

00:35:06.930 --> 00:35:07.430 genomics.

NOTE Confidence: 0.9760742

00:35:07.730 --> 00:35:08.530 And one way to think

NOTE Confidence: 0.9760742

00:35:08.530 --> 00:35:09.250 about it is that, you

NOTE Confidence: 0.9760742

00:35:09.250 --> 00:35:10.530 know, genomics has just seen

NOTE Confidence: 0.9760742

00:35:10.530 --> 00:35:11.810 this wave of technology that's

NOTE Confidence: 0.9760742

00:35:11.810 --> 00:35:14.065 given us insights above the

NOTE Confidence: 0.9760742

00:35:14.065 --> 00:35:14.565 waterline,

NOTE Confidence: 0.92428154

00:35:15.344 --> 00:35:16.965 about DNA sequence and DNA

NOTE Confidence: 0.92428154

00:35:17.185 --> 00:35:18.005 sequence variation.

NOTE Confidence: 0.95327526

00:35:18.305 --> 00:35:19.344 But there's all these other

NOTE Confidence: 0.95327526

00:35:19.344 --> 00:35:20.805 things going on, and increasing

NOTE Confidence: 0.95327526

00:35:20.864 --> 00:35:21.765 the same technologies

NOTE Confidence: 0.9977214

00:35:22.065 --> 00:35:22.965 can be adapted

NOTE Confidence: 0.99604493

00:35:23.265 --> 00:35:25.045 to give readouts on transcriptomics

NOTE Confidence: 0.9577637

00:35:25.425 --> 00:35:26.085 and proteomics

NOTE Confidence: 0.979681

00:35:26.550 --> 00:35:28.150 and epigenomic changes and so

NOTE Confidence: 0.979681

00:35:28.150 --> 00:35:29.510 on and so forth. And

NOTE Confidence: 0.979681

00:35:29.510 --> 00:35:30.790 increasingly and I will have

NOTE Confidence: 0.979681

00:35:30.790 --> 00:35:32.469 to change my vocabulary because

NOTE Confidence: 0.979681

00:35:32.469 --> 00:35:33.770 I will always say genomics,

NOTE Confidence: 0.9788856

00:35:34.070 --> 00:35:35.350 but that's gonna almost be

NOTE Confidence: 0.9788856

00:35:35.350 --> 00:35:36.550 something that's gonna be about

NOTE Confidence: 0.9788856

00:35:36.550 --> 00:35:37.050 multiomics.

NOTE Confidence: 0.9411621

00:35:37.510 --> 00:35:38.250 And increasingly,

NOTE Confidence: 0.9733887

00:35:38.550 --> 00:35:39.830 you're gonna start to see

NOTE Confidence: 0.9733887

00:35:39.830 --> 00:35:40.330 datasets

NOTE Confidence: 0.98539734

00:35:40.994 --> 00:35:42.194 that are gonna be delivered

NOTE Confidence: 0.98539734

00:35:42.194 --> 00:35:43.394 on patients as part of

NOTE Confidence: 0.98539734

00:35:43.394 --> 00:35:45.154 diagnostic workups for rare genetic

NOTE Confidence: 0.98539734

00:35:45.154 --> 00:35:46.114 disease. Maybe that accounts for

NOTE Confidence: 0.98539734

00:35:46.114 --> 00:35:46.755 some of the ones we

NOTE Confidence: 0.98539734

00:35:46.755 --> 00:35:48.694 can't diagnose. These other modalities

NOTE Confidence: 0.98539734

00:35:48.755 --> 00:35:50.035 will give us clues. You'll

NOTE Confidence: 0.98539734

00:35:50.035 --> 00:35:51.575 see this all across research.

NOTE Confidence: 0.98539734

00:35:51.714 --> 00:35:52.755 You're gonna hear a lot

NOTE Confidence: 0.98539734

00:35:52.755 --> 00:35:54.674 about data integration represented by

NOTE Confidence: 0.98539734

00:35:54.674 --> 00:35:55.900 the middle panel, and you're

NOTE Confidence: 0.98539734

00:35:55.900 --> 00:35:56.780 gonna start to see how

NOTE Confidence: 0.98539734

00:35:56.780 --> 00:35:58.160 we can extract insights

NOTE Confidence: 1

00:35:58.460 --> 00:35:59.680 from the data analysis

NOTE Confidence: 0.97924805

00:36:00.060 --> 00:36:01.520 of these integrated datasets.

NOTE Confidence: 0.99316406

00:36:01.980 --> 00:36:02.719 And so

NOTE Confidence: 0.9961548

00:36:03.100 --> 00:36:04.780 if you just look at

NOTE Confidence: 0.9961548

00:36:04.780 --> 00:36:06.239 rare genetic diseases,

NOTE Confidence: 0.8620257

00:36:06.540 --> 00:36:07.739 I it sounds great and

NOTE Confidence: 0.8620257

00:36:07.739 --> 00:36:08.480 it hypothetical,

NOTE Confidence: 0.97305834

00:36:08.780 --> 00:36:10.224 but it's actually real. And

NOTE Confidence: 0.97305834

00:36:10.224 --> 00:36:11.425 it's all once again, I

NOTE Confidence: 0.97305834

00:36:11.425 --> 00:36:12.385 love when I see review

NOTE Confidence: 0.97305834

00:36:12.385 --> 00:36:14.385 articles or major articles. Across

NOTE Confidence: 0.97305834

00:36:14.385 --> 00:36:15.744 the board, you're hearing more

NOTE Confidence: 0.97305834

00:36:15.744 --> 00:36:17.185 and more publication. You're seeing

NOTE Confidence: 0.97305834

00:36:17.185 --> 00:36:18.244 more and more publications

NOTE Confidence: 0.975

00:36:18.704 --> 00:36:19.984 talking about the use of

NOTE Confidence: 0.975

00:36:19.984 --> 00:36:21.665 multi omics as part of

NOTE Confidence: 0.975

00:36:21.665 --> 00:36:23.969 rare genetic diseases with respect

NOTE Confidence: 0.975

00:36:23.969 --> 00:36:24.930 to the study of the

NOTE Confidence: 0.975

00:36:24.930 --> 00:36:26.469 diseases and also the diagnostics

NOTE Confidence: 0.9362793

00:36:26.850 --> 00:36:28.550 associated with working this up.

NOTE Confidence: 0.9362793

00:36:28.610 --> 00:36:29.810 And so as a result

NOTE Confidence: 0.9362793

00:36:29.810 --> 00:36:30.930 of this, people are beginning

NOTE Confidence: 0.9362793

00:36:30.930 --> 00:36:32.710 to prioritize multi omics

NOTE Confidence: 0.98871523

00:36:33.010 --> 00:36:34.310 beyond just genomics.

NOTE Confidence: 0.986642

00:36:34.690 --> 00:36:35.650 In fact, one of the

NOTE Confidence: 0.986642

00:36:35.650 --> 00:36:36.550 very last

NOTE Confidence: 0.9468604

00:36:36.945 --> 00:36:38.385 programs I stood up as

NOTE Confidence: 0.9468604

00:36:38.385 --> 00:36:40.145 the NHGRI director is a

NOTE Confidence: 0.9468604

00:36:40.145 --> 00:36:41.265 program that's now in its

NOTE Confidence: 0.9468604

00:36:41.265 --> 00:36:43.185 third year called Multi Omics

NOTE Confidence: 0.9468604

00:36:43.185 --> 00:36:44.305 for Health and Disease or

NOTE Confidence: 0.9468604

00:36:44.305 --> 00:36:45.985 Mode, where it it's exactly

NOTE Confidence: 0.9468604

00:36:45.985 --> 00:36:47.105 as the name implies, and

NOTE Confidence: 0.9468604

00:36:47.105 --> 00:36:48.625 it supports this consortium where

NOTE Confidence: 0.9468604

00:36:48.625 --> 00:36:49.665 they're taking a series of

NOTE Confidence: 0.9468604

00:36:49.665 --> 00:36:51.585 diseases, and they're using multiple

NOTE Confidence: 0.9468604

00:36:51.585 --> 00:36:52.085 omics

NOTE Confidence: 0.99869794

00:36:52.400 --> 00:36:53.520 to see how they can

NOTE Confidence: 0.99869794

00:36:53.520 --> 00:36:54.020 operationalize

NOTE Confidence: 0.8605957

00:36:54.320 --> 00:36:55.060 those analyses

NOTE Confidence: 0.9708467

00:36:55.360 --> 00:36:56.080 to be able to gain

NOTE Confidence: 0.9708467

00:36:56.080 --> 00:36:58.160 new insights about these about

NOTE Confidence: 0.9708467

00:36:58.160 --> 00:36:59.120 the those diseases that are

NOTE Confidence: 0.9708467

00:36:59.120 --> 00:36:59.860 being studied.

NOTE Confidence: 0.9607222

00:37:00.320 --> 00:37:01.840 And then in my new

NOTE Confidence: 0.9607222

00:37:01.840 --> 00:37:03.120 hat at Illumina, I can

NOTE Confidence: 0.9607222

00:37:03.120 --> 00:37:04.320 tell you Illumina is serious

NOTE Confidence: 0.9607222

00:37:04.320 --> 00:37:05.575 about this. They think there's

NOTE Confidence: 0.9607222

00:37:05.575 --> 00:37:06.535 more to see, more to

NOTE Confidence: 0.9607222

00:37:06.535 --> 00:37:08.315 understand, more with multi omics,

NOTE Confidence: 0.9607222

00:37:08.535 --> 00:37:10.635 and they're not only delivering

NOTE Confidence: 0.9607222

00:37:10.855 --> 00:37:12.375 platform the same boxes that

NOTE Confidence: 0.9607222

00:37:12.375 --> 00:37:13.655 are used for sequencing are

NOTE Confidence: 0.9607222

00:37:13.655 --> 00:37:15.255 now being adapted for getting

NOTE Confidence: 0.9607222

00:37:15.255 --> 00:37:17.094 methylation data and getting other

NOTE Confidence: 0.9607222

00:37:17.094 --> 00:37:18.950 types of data, certainly transcriptomic

NOTE Confidence: 0.9607222

00:37:19.170 --> 00:37:21.810 data, increasingly spatial genomics data,

NOTE Confidence: 0.9607222

00:37:21.810 --> 00:37:23.170 other types of data, all

NOTE Confidence: 0.9607222

00:37:23.170 --> 00:37:24.690 with software platforms to help

NOTE Confidence: 0.9607222

00:37:24.690 --> 00:37:25.910 support the data analysis.

NOTE Confidence: 0.99193174

00:37:26.290 --> 00:37:28.450 So the public sector supporting

NOTE Confidence: 0.99193174

00:37:28.450 --> 00:37:30.165 research in this area and

NOTE Confidence: 0.99193174

00:37:30.165 --> 00:37:31.925 and companies like Illumina supporting

NOTE Confidence: 0.99193174

00:37:31.925 --> 00:37:33.125 research in this area as

NOTE Confidence: 0.99193174

00:37:33.125 --> 00:37:33.625 well.

NOTE Confidence: 0.9888226

00:37:34.645 --> 00:37:36.405 So with respect to genetic

NOTE Confidence: 0.9888226

00:37:36.485 --> 00:37:38.565 rare genetic diseases, I introduced

NOTE Confidence: 0.9888226

00:37:38.565 --> 00:37:39.445 you to the idea of

NOTE Confidence: 0.9888226

00:37:39.445 --> 00:37:41.685 just routine diagnostic workup of

NOTE Confidence: 0.9888226

00:37:41.685 --> 00:37:42.905 these, of patients.

NOTE Confidence: 0.9736585

00:37:43.800 --> 00:37:46.120 I mentioned rapid genome sequencing

NOTE Confidence: 0.9736585

00:37:46.120 --> 00:37:47.160 in the case of of

NOTE Confidence: 0.9736585

00:37:47.160 --> 00:37:48.600 of newborns. I didn't really

NOTE Confidence: 0.9736585

00:37:48.600 --> 00:37:49.820 talk much about reproductive

NOTE Confidence: 0.95161134

00:37:50.440 --> 00:37:52.060 carrier screening, but I could,

NOTE Confidence: 0.99583524

00:37:52.360 --> 00:37:53.480 and there's certainly a very

NOTE Confidence: 0.99583524

00:37:53.480 --> 00:37:54.600 interesting area to keep an

NOTE Confidence: 0.99583524

00:37:54.600 --> 00:37:56.040 eye on. And later in

NOTE Confidence: 0.99583524

00:37:56.040 --> 00:37:57.000 my talk, I'm gonna come

NOTE Confidence: 0.99583524

00:37:57.000 --> 00:37:58.215 to the idea of screening

NOTE Confidence: 0.99583524

00:37:58.215 --> 00:37:59.815 newborns by genome sequencing. But

NOTE Confidence: 0.99583524

00:37:59.815 --> 00:38:00.795 before I get to

NOTE Confidence: 0.96974283

00:38:01.095 --> 00:38:02.395 that, there is this important

NOTE Confidence: 0.96974283

00:38:02.415 --> 00:38:04.635 point in life called birth.

NOTE Confidence: 0.96974283

00:38:04.855 --> 00:38:06.295 And just before birth has

NOTE Confidence: 0.96974283

00:38:06.295 --> 00:38:07.015 been one of the most

NOTE Confidence: 0.96974283

00:38:07.015 --> 00:38:09.015 fertile areas of genomics actually,

NOTE Confidence: 0.96974283

00:38:09.015 --> 00:38:10.069 fertile area. That's actually sort

NOTE Confidence: 0.96974283

00:38:10.069 --> 00:38:11.030 of a cute little metaphor.

NOTE Confidence: 0.96974283

00:38:11.030 --> 00:38:12.150 I've never said that before.

NOTE Confidence: 0.96974283

00:38:12.150 --> 00:38:13.690 It's a very productive area

NOTE Confidence: 0.9366455

00:38:13.989 --> 00:38:15.210 because it turns out

NOTE Confidence: 0.9983259

00:38:15.590 --> 00:38:17.850 that the most used genomic

NOTE Confidence: 0.9983259

00:38:18.070 --> 00:38:19.050 test today

NOTE Confidence: 0.9742838

00:38:19.510 --> 00:38:20.570 is noninvasive

NOTE Confidence: 0.99675584

00:38:20.870 --> 00:38:22.710 prenatal genomic testing. You may

NOTE Confidence: 0.99675584

00:38:22.710 --> 00:38:23.830 not realize this, but let

NOTE Confidence: 0.99675584

00:38:23.830 --> 00:38:25.575 me just remind you that

NOTE Confidence: 0.99675584

00:38:25.575 --> 00:38:27.015 in the old days, meaning

NOTE Confidence: 0.99675584

00:38:27.015 --> 00:38:27.835 before genomics,

NOTE Confidence: 0.9601593

00:38:28.215 --> 00:38:29.335 lots of couples, not all

NOTE Confidence: 0.9601593

00:38:29.335 --> 00:38:30.455 couples, but lot of couples

NOTE Confidence: 0.9601593

00:38:30.455 --> 00:38:31.895 were interested in getting genomic

NOTE Confidence: 0.9601593

00:38:31.895 --> 00:38:32.395 information

NOTE Confidence: 0.961853

00:38:32.855 --> 00:38:34.395 about their unborn child.

NOTE Confidence: 0.91552734

00:38:34.855 --> 00:38:36.234 And they would typically,

NOTE Confidence: 0.9137533

00:38:36.535 --> 00:38:38.295 through an invasive procedure like

NOTE Confidence: 0.9137533

00:38:38.295 --> 00:38:39.415 what my wife went through

NOTE Confidence: 0.9137533

00:38:39.415 --> 00:38:40.555 for our two kids, an

NOTE Confidence: 0.95688474

00:38:41.390 --> 00:38:42.610 amniocentesis, which is unpleasant.

NOTE Confidence: 0.9696452

00:38:42.989 --> 00:38:44.270 It is expensive, and it's

NOTE Confidence: 0.9696452

00:38:44.270 --> 00:38:45.330 actually a little dangerous.

NOTE Confidence: 0.9503967

00:38:45.950 --> 00:38:47.150 But you get out a

NOTE Confidence: 0.9503967

00:38:47.150 --> 00:38:48.430 carrier type, and you could

NOTE Confidence: 0.9503967

00:38:48.430 --> 00:38:49.550 look for any employees, like

NOTE Confidence: 0.9503967

00:38:49.550 --> 00:38:50.910 three copies of chromosome twenty

NOTE Confidence: 0.9503967

00:38:50.910 --> 00:38:52.590 one. This doesn't have to

NOTE Confidence: 0.9503967

00:38:52.590 --> 00:38:53.469 be done this way anymore.

NOTE Confidence: 0.9503967

00:38:53.469 --> 00:38:54.350 In fact, it's not being

NOTE Confidence: 0.9503967

00:38:54.350 --> 00:38:55.650 done this way anymore routinely.

NOTE Confidence: 0.9819824

00:38:56.085 --> 00:38:58.085 The frontline diagnostic tool takes

NOTE Confidence: 0.9819824

00:38:58.085 --> 00:39:00.185 advantage of the fact that

NOTE Confidence: 0.9723929

00:39:00.885 --> 00:39:02.965 that mothers and fetuses and

NOTE Confidence: 0.9723929

00:39:02.965 --> 00:39:04.825 the placenta naturally shed DNA

NOTE Confidence: 0.9723929

00:39:04.965 --> 00:39:06.085 into the bloodstream of a

NOTE Confidence: 0.9723929

00:39:06.085 --> 00:39:07.065 pregnant individual,

NOTE Confidence: 0.96767956

00:39:07.445 --> 00:39:08.885 and that DNA can is

NOTE Confidence: 0.96767956

00:39:08.885 --> 00:39:10.405 cell free DNA, and it

NOTE Confidence: 0.96767956

00:39:10.405 --> 00:39:11.385 can be analyzed.

NOTE Confidence: 0.91844773

00:39:11.685 --> 00:39:12.989 And you can analyze it

NOTE Confidence: 0.91844773

00:39:12.989 --> 00:39:14.430 not through an invasive procedure,

NOTE Confidence: 0.91844773

00:39:14.430 --> 00:39:15.390 but through a simple blood

NOTE Confidence: 0.91844773

00:39:15.390 --> 00:39:16.989 draw. Well, pregnant individuals getting

NOTE Confidence: 0.91844773

00:39:16.989 --> 00:39:17.950 lots of blood draws. Just

NOTE Confidence: 0.91844773

00:39:17.950 --> 00:39:19.390 one extra tube off it

NOTE Confidence: 0.91844773

00:39:19.390 --> 00:39:20.750 goes. Actually, most typically to

NOTE Confidence: 0.91844773

00:39:20.750 --> 00:39:22.430 a company now because companies

NOTE Confidence: 0.91844773

00:39:22.430 --> 00:39:23.550 have just sprung up to

NOTE Confidence: 0.91844773

00:39:23.550 --> 00:39:24.530 do this noninvasive

NOTE Confidence: 0.9970703

00:39:24.830 --> 00:39:25.810 prenatal testing.

NOTE Confidence: 0.973787

00:39:26.795 --> 00:39:28.155 Insurance companies are paying for

NOTE Confidence: 0.973787

00:39:28.155 --> 00:39:29.435 it. That catalyzed it as

NOTE Confidence: 0.973787

00:39:29.435 --> 00:39:31.035 well. And all they're doing

NOTE Confidence: 0.973787

00:39:31.035 --> 00:39:32.735 is counting and assigning

NOTE Confidence: 0.92757684

00:39:33.195 --> 00:39:34.795 read counts to chromosomes. And

NOTE Confidence: 0.92757684

00:39:34.795 --> 00:39:35.915 if they see an abnormal

NOTE Confidence: 0.92757684

00:39:35.915 --> 00:39:37.035 ratio, like too many going

NOTE Confidence: 0.92757684

00:39:37.035 --> 00:39:38.655 to twenty one, it signals

NOTE Confidence: 0.92757684

00:39:38.795 --> 00:39:40.075 they need a follow-up test

NOTE Confidence: 0.92757684

00:39:40.075 --> 00:39:40.715 to see if there's an

NOTE Confidence: 0.92757684

00:39:40.715 --> 00:39:41.215 aneuploidy.

NOTE Confidence: 0.97148436

00:39:42.050 --> 00:39:43.250 Guess what? It's now the

NOTE Confidence: 0.97148436

00:39:43.250 --> 00:39:44.790 number one genomic test worldwide.

NOTE Confidence: 0.9560328

00:39:45.489 --> 00:39:47.330 Eight million pregnant individuals that

NOTE Confidence: 0.9560328

00:39:47.330 --> 00:39:48.770 is estimated around the world

NOTE Confidence: 0.9560328

00:39:48.770 --> 00:39:50.530 will get this noninvasive genetic

NOTE Confidence: 0.9560328

00:39:50.530 --> 00:39:51.890 test done, making it the

NOTE Confidence: 0.9560328

00:39:51.890 --> 00:39:53.090 number one genomic test. It's

NOTE Confidence: 0.9560328

00:39:53.090 --> 00:39:53.590 completely

NOTE Confidence: 0.9993286

00:39:54.050 --> 00:39:56.050 changed how prenatal genetic testing

NOTE Confidence: 0.9993286

00:39:56.050 --> 00:39:56.869 has been done.

NOTE Confidence: 0.9781901

00:39:57.665 --> 00:39:59.984 So that's that so fourth

NOTE Confidence: 0.9781901

00:39:59.984 --> 00:40:00.484 area,

NOTE Confidence: 0.92897725

00:40:00.864 --> 00:40:01.984 which I'm only gonna mention

NOTE Confidence: 0.92897725

00:40:01.984 --> 00:40:03.025 but not talk about is

NOTE Confidence: 0.92897725

00:40:03.025 --> 00:40:03.525 pharmacogenomics,

NOTE Confidence: 0.9718112

00:40:03.984 --> 00:40:05.364 two big words put together.

NOTE Confidence: 0.9718112

00:40:05.505 --> 00:40:06.945 But bottom line is people

NOTE Confidence: 0.9718112

00:40:06.945 --> 00:40:09.025 respond to medications differently. We've

NOTE Confidence: 0.9718112

00:40:09.025 --> 00:40:10.299 always been perplexed by it,

NOTE Confidence: 0.9718112

00:40:10.299 --> 00:40:11.339 and we've always done sort

NOTE Confidence: 0.9718112

00:40:11.339 --> 00:40:11.980 of in a hit and

NOTE Confidence: 0.9718112

00:40:11.980 --> 00:40:13.500 miss way picking the best

NOTE Confidence: 0.9718112

00:40:13.500 --> 00:40:15.200 medication. We are increasingly

NOTE Confidence: 0.9697808

00:40:15.500 --> 00:40:17.900 learning that variants in genes

NOTE Confidence: 0.9697808

00:40:17.900 --> 00:40:19.200 involved in drug metabolism

NOTE Confidence: 0.96470135

00:40:19.819 --> 00:40:21.020 are are have a a

NOTE Confidence: 0.96470135

00:40:21.020 --> 00:40:23.020 large effect on why people

NOTE Confidence: 0.96470135

00:40:23.020 --> 00:40:24.844 respond to certain medications better

NOTE Confidence: 0.96470135

00:40:24.844 --> 00:40:25.724 or worse or why they

NOTE Confidence: 0.96470135

00:40:25.724 --> 00:40:27.025 need their dosage adjusted.

NOTE Confidence: 0.9949049

00:40:27.484 --> 00:40:28.444 We are learning more and

NOTE Confidence: 0.9949049

00:40:28.444 --> 00:40:29.484 more about what those variants

NOTE Confidence: 0.9949049

00:40:29.484 --> 00:40:30.684 are. We're figuring out how

NOTE Confidence: 0.9949049

00:40:30.684 --> 00:40:31.325 to be able to read

NOTE Confidence: 0.9949049

00:40:31.325 --> 00:40:32.224 them out efficiently.

NOTE Confidence: 0.95229733

00:40:32.684 --> 00:40:34.045 It turns out it hasn't

NOTE Confidence: 0.95229733

00:40:34.045 --> 00:40:35.724 hit as much mainstream because

NOTE Confidence: 0.95229733

00:40:35.724 --> 00:40:37.404 physicians are difficult to change

NOTE Confidence: 0.95229733

00:40:37.404 --> 00:40:38.820 their behavior, and they don't

NOTE Confidence: 0.95229733

00:40:38.820 --> 00:40:40.260 like a test beam between

NOTE Confidence: 0.95229733

00:40:40.260 --> 00:40:41.300 them and and and the

NOTE Confidence: 0.95229733

00:40:41.300 --> 00:40:42.900 other patients getting the drug

NOTE Confidence: 0.95229733

00:40:42.900 --> 00:40:44.500 they want. So there's there's

NOTE Confidence: 0.95229733

00:40:44.500 --> 00:40:45.000 implementation

NOTE Confidence: 0.9510283

00:40:45.300 --> 00:40:46.500 issues. There's lots of reasons

NOTE Confidence: 0.9510283

00:40:46.500 --> 00:40:47.380 I think this will change.

NOTE Confidence: 0.9510283

00:40:47.380 --> 00:40:49.239 At some institutions, this absolutely

NOTE Confidence: 0.9510283

00:40:49.300 --> 00:40:49.960 is changing,

NOTE Confidence: 0.9638372

00:40:50.515 --> 00:40:51.635 partially through the implementation of

NOTE Confidence: 0.9638372

00:40:51.635 --> 00:40:53.555 clinical decision support tools and

NOTE Confidence: 0.9638372

00:40:53.555 --> 00:40:54.755 the electronic record and blah

NOTE Confidence: 0.9638372

00:40:54.755 --> 00:40:55.635 blah blah. There's lots we

NOTE Confidence: 0.9638372

00:40:55.635 --> 00:40:56.994 could talk about. Needless to

NOTE Confidence: 0.9638372

00:40:56.994 --> 00:40:58.114 say, this is still an

NOTE Confidence: 0.9638372

00:40:58.114 --> 00:40:59.795 evolving area. It's been a

NOTE Confidence: 0.9638372

00:40:59.795 --> 00:41:00.994 little disappointing for some of

NOTE Confidence: 0.9638372

00:41:00.994 --> 00:41:01.875 us that it hasn't happened

NOTE Confidence: 0.9638372

00:41:01.875 --> 00:41:03.410 sooner, but trust me. It

NOTE Confidence: 0.9638372

00:41:03.410 --> 00:41:04.770 has happened in cancer. So

NOTE Confidence: 0.9638372

00:41:04.770 --> 00:41:05.430 in pharmacogenomics

NOTE Confidence: 0.93525136

00:41:05.730 --> 00:41:06.770 and cancer has been much

NOTE Confidence: 0.93525136

00:41:06.770 --> 00:41:07.970 more heavily used than in

NOTE Confidence: 0.93525136

00:41:07.970 --> 00:41:09.090 in other types of medicine,

NOTE Confidence: 0.93525136

00:41:09.090 --> 00:41:10.310 but more will come.

NOTE Confidence: 0.9274205

00:41:10.770 --> 00:41:12.530 I also wanted to immediately

NOTE Confidence: 0.9274205

00:41:12.530 --> 00:41:13.650 also point out that sometimes

NOTE Confidence: 0.9274205

00:41:13.650 --> 00:41:14.450 it was, oh, you talk

NOTE Confidence: 0.9274205

00:41:14.450 --> 00:41:15.990 about medicine. What about prevention?

NOTE Confidence: 0.9274205

00:41:16.175 --> 00:41:17.935 Is genomics helping there? Absolutely.

NOTE Confidence: 0.9274205

00:41:17.935 --> 00:41:19.695 Genomics absolutely having to play

NOTE Confidence: 0.9274205

00:41:19.695 --> 00:41:21.155 a major role in prevention,

NOTE Confidence: 0.982629

00:41:21.455 --> 00:41:22.815 but be careful what type

NOTE Confidence: 0.982629

00:41:22.815 --> 00:41:24.175 of of of tools you're

NOTE Confidence: 0.982629

00:41:24.175 --> 00:41:25.535 talking about and what types

NOTE Confidence: 0.982629

00:41:25.535 --> 00:41:27.135 of diseases you're talking about.

NOTE Confidence: 0.982629

00:41:27.135 --> 00:41:28.355 There really is a bifurcation

NOTE Confidence: 0.982629

00:41:28.575 --> 00:41:29.614 because when it comes to

NOTE Confidence: 0.982629

00:41:29.614 --> 00:41:30.835 rare genetic diseases,

NOTE Confidence: 0.99853516

00:41:31.560 --> 00:41:32.060 prevention,

NOTE Confidence: 0.9352214

00:41:32.440 --> 00:41:32.940 genomics,

NOTE Confidence: 0.98279124

00:41:33.320 --> 00:41:34.840 here and now. And it

NOTE Confidence: 0.98279124

00:41:34.840 --> 00:41:36.440 happens for this gentleman right

NOTE Confidence: 0.98279124

00:41:36.440 --> 00:41:37.660 here. Maybe he's,

NOTE Confidence: 0.9521942

00:41:38.120 --> 00:41:39.080 just had a sister who

NOTE Confidence: 0.9521942

00:41:39.080 --> 00:41:40.620 in her thirties was diagnosed

NOTE Confidence: 0.9521942

00:41:40.680 --> 00:41:42.600 with, colon cancer. When that

NOTE Confidence: 0.9521942

00:41:42.600 --> 00:41:43.100 happens,

NOTE Confidence: 0.95063686

00:41:43.625 --> 00:41:44.905 people will jump in and

NOTE Confidence: 0.95063686

00:41:44.905 --> 00:41:46.344 immediately say, boy, you know,

NOTE Confidence: 0.95063686

00:41:46.344 --> 00:41:47.224 you may have something like

NOTE Confidence: 0.95063686

00:41:47.224 --> 00:41:48.424 Lynch syndrome. We should test

NOTE Confidence: 0.95063686

00:41:48.424 --> 00:41:49.704 for the known genes that

NOTE Confidence: 0.95063686

00:41:49.704 --> 00:41:51.165 give to a cancer predisposition

NOTE Confidence: 0.95063686

00:41:51.385 --> 00:41:52.265 at a young age, and

NOTE Confidence: 0.95063686

00:41:52.265 --> 00:41:53.305 you should get tested, and

NOTE Confidence: 0.95063686

00:41:53.305 --> 00:41:54.424 your other siblings should get

NOTE Confidence: 0.95063686

00:41:54.424 --> 00:41:55.565 tested. Cascade

NOTE Confidence: 0.9264642

00:41:55.864 --> 00:41:57.099 testing, and boom, all of

NOTE Confidence: 0.9264642

00:41:57.099 --> 00:41:57.980 a sudden you find out

NOTE Confidence: 0.9264642

00:41:57.980 --> 00:41:59.180 which members of the family

NOTE Confidence: 0.9264642

00:41:59.180 --> 00:42:01.260 have the the mutation and

NOTE Confidence: 0.9264642

00:42:01.260 --> 00:42:02.800 then screen them more proactively,

NOTE Confidence: 0.9264642

00:42:02.940 --> 00:42:04.940 surveil them more proactively, catch

NOTE Confidence: 0.9264642

00:42:04.940 --> 00:42:06.859 any cancer earlier. That's absolutely

NOTE Confidence: 0.9264642

00:42:06.859 --> 00:42:08.140 here and now for b

NOTE Confidence: 0.9264642

00:42:08.140 --> 00:42:09.660 a c r BRCA one

NOTE Confidence: 0.9264642

00:42:09.660 --> 00:42:11.114 and breast and ovarian cancer,

NOTE Confidence: 0.9264642

00:42:11.195 --> 00:42:12.315 for Lynch Syndrome and so

NOTE Confidence: 0.9264642

00:42:12.315 --> 00:42:13.755 forth. But we also have

NOTE Confidence: 0.9264642

00:42:13.755 --> 00:42:15.355 prevention for youngsters, and I'm

NOTE Confidence: 0.9264642

00:42:15.355 --> 00:42:16.155 gonna talk in a bit

NOTE Confidence: 0.9264642

00:42:16.155 --> 00:42:17.755 about prenatal not prenatal,

NOTE Confidence: 0.9141846

00:42:18.315 --> 00:42:19.295 newborn screening.

NOTE Confidence: 0.96571517

00:42:19.594 --> 00:42:20.795 But this little girl may

NOTE Confidence: 0.96571517

00:42:20.795 --> 00:42:21.755 have been picked up at

NOTE Confidence: 0.96571517

00:42:21.755 --> 00:42:22.475 a at a very at

NOTE Confidence: 0.96571517

00:42:22.475 --> 00:42:24.075 birth or shortly after birth

NOTE Confidence: 0.96571517

00:42:24.075 --> 00:42:25.750 through genetic screening and found

NOTE Confidence: 0.96571517

00:42:25.750 --> 00:42:26.950 to have a mutation in

NOTE Confidence: 0.96571517

00:42:26.950 --> 00:42:27.910 a gene that is really

NOTE Confidence: 0.96571517

00:42:27.910 --> 00:42:29.269 important for how she digest

NOTE Confidence: 0.96571517

00:42:29.269 --> 00:42:30.710 food, and she would get

NOTE Confidence: 0.96571517

00:42:30.869 --> 00:42:32.069 have cognitive delay if we

NOTE Confidence: 0.96571517

00:42:32.069 --> 00:42:33.109 didn't change her diet, but

NOTE Confidence: 0.96571517

00:42:33.109 --> 00:42:34.150 we could change her diet.

NOTE Confidence: 0.96571517

00:42:34.150 --> 00:42:35.829 And so there's other increasing

NOTE Confidence: 0.96571517

00:42:35.829 --> 00:42:37.509 numbers of these circumstances where

NOTE Confidence: 0.96571517

00:42:37.509 --> 00:42:38.329 simple interventions

NOTE Confidence: 0.8755929

00:42:38.735 --> 00:42:40.495 truly do prevent disease. And

NOTE Confidence: 0.8755929

00:42:40.495 --> 00:42:42.094 so prevention and gen in

NOTE Confidence: 0.8755929

00:42:42.094 --> 00:42:43.635 genomics here and now.

NOTE Confidence: 0.948645

00:42:44.094 --> 00:42:45.295 Where it gets a little

NOTE Confidence: 0.948645

00:42:45.295 --> 00:42:46.415 tricky and we're at an

NOTE Confidence: 0.948645

00:42:46.415 --> 00:42:48.495 awkward phase right now is

NOTE Confidence: 0.948645

00:42:48.495 --> 00:42:49.614 when it comes to common

NOTE Confidence: 0.948645

00:42:49.614 --> 00:42:51.715 diseases. Because for common diseases,

NOTE Confidence: 0.948645

00:42:51.775 --> 00:42:53.360 we don't really have a

NOTE Confidence: 0.948645

00:42:53.360 --> 00:42:54.239 lot of examples where we

NOTE Confidence: 0.948645

00:42:54.239 --> 00:42:55.860 can point to specific variants.

NOTE Confidence: 0.92822266

00:42:56.560 --> 00:42:57.300 But rather,

NOTE Confidence: 0.9885742

00:42:57.680 --> 00:42:58.800 what we have is the

NOTE Confidence: 0.9885742

00:42:58.800 --> 00:43:00.340 ability to do a flyover

NOTE Confidence: 0.99250597

00:43:00.800 --> 00:43:02.480 over a person's genome and

NOTE Confidence: 0.99250597

00:43:02.480 --> 00:43:04.500 collect information about what variants

NOTE Confidence: 0.99250597

00:43:04.560 --> 00:43:06.484 they have and then correlate

NOTE Confidence: 0.99250597

00:43:06.625 --> 00:43:07.664 their set of three to

NOTE Confidence: 0.99250597

00:43:07.664 --> 00:43:08.724 five billion variants

NOTE Confidence: 0.976225

00:43:09.025 --> 00:43:11.184 with other people who either

NOTE Confidence: 0.976225

00:43:11.184 --> 00:43:12.224 have or don't have a

NOTE Confidence: 0.976225

00:43:12.224 --> 00:43:14.545 disease like sudden cardiac death

NOTE Confidence: 0.976225

00:43:14.545 --> 00:43:15.364 or hyperlipidemia

NOTE Confidence: 0.9915924

00:43:15.904 --> 00:43:16.625 or so on and so

NOTE Confidence: 0.9915924

00:43:16.625 --> 00:43:17.744 forth. And that has led

NOTE Confidence: 0.9915924

00:43:17.744 --> 00:43:18.944 to the ability to do

NOTE Confidence: 0.9915924

00:43:18.944 --> 00:43:19.444 distributions

NOTE Confidence: 0.9947917

00:43:19.904 --> 00:43:21.350 of of risk

NOTE Confidence: 0.97563475

00:43:21.730 --> 00:43:23.650 based on correlations of people's

NOTE Confidence: 0.97563475

00:43:23.650 --> 00:43:25.170 set of genomic variance. This

NOTE Confidence: 0.97563475

00:43:25.170 --> 00:43:25.890 has led to the idea

NOTE Confidence: 0.97563475

00:43:25.890 --> 00:43:27.510 of a polygenic risk score,

NOTE Confidence: 0.9977417

00:43:28.050 --> 00:43:29.570 and there's some pretty cool

NOTE Confidence: 0.9977417

00:43:29.570 --> 00:43:30.550 data out there.

NOTE Confidence: 0.98393553

00:43:30.850 --> 00:43:32.735 And the problem is it's

NOTE Confidence: 0.98393553

00:43:32.735 --> 00:43:34.415 still under construction. It's still

NOTE Confidence: 0.98393553

00:43:34.415 --> 00:43:36.335 under study. It's still not

NOTE Confidence: 0.98393553

00:43:36.335 --> 00:43:38.035 quite ready for prime time.

NOTE Confidence: 0.9936148

00:43:38.415 --> 00:43:39.775 And it's something that NIH

NOTE Confidence: 0.9936148

00:43:39.775 --> 00:43:40.735 is funding in a big

NOTE Confidence: 0.9936148

00:43:40.735 --> 00:43:41.775 way to try to explore

NOTE Confidence: 0.9936148

00:43:41.775 --> 00:43:42.575 because it has a lot

NOTE Confidence: 0.9936148

00:43:42.575 --> 00:43:43.935 of potential to be able

NOTE Confidence: 0.9936148

00:43:43.935 --> 00:43:44.430 to

NOTE Confidence: 0.9797098

00:43:44.750 --> 00:43:46.430 find out who's at greatest

NOTE Confidence: 0.9797098

00:43:46.430 --> 00:43:47.630 risk and maybe able to

NOTE Confidence: 0.9797098

00:43:47.630 --> 00:43:48.910 do some interventions to try

NOTE Confidence: 0.9797098

00:43:48.910 --> 00:43:50.589 to dampen that risk. And

NOTE Confidence: 0.9797098

00:43:50.589 --> 00:43:51.790 so this is one of

NOTE Confidence: 0.9797098

00:43:51.790 --> 00:43:54.030 these areas where immediately what

NOTE Confidence: 0.9797098

00:43:54.030 --> 00:43:55.309 happens in a country like

NOTE Confidence: 0.9797098

00:43:55.309 --> 00:43:56.989 the United States is that

NOTE Confidence: 0.9797098

00:43:56.989 --> 00:43:58.030 there seems to be some

NOTE Confidence: 0.9797098

00:43:58.030 --> 00:43:58.530 excitement.

NOTE Confidence: 0.96993583

00:43:58.905 --> 00:44:00.585 There absolutely is some good

NOTE Confidence: 0.96993583

00:44:00.585 --> 00:44:01.645 effective examples

NOTE Confidence: 0.9836263

00:44:02.185 --> 00:44:03.385 seemingly, but we need to

NOTE Confidence: 0.9836263

00:44:03.385 --> 00:44:04.425 have clinical trials to do

NOTE Confidence: 0.9836263

00:44:04.425 --> 00:44:06.445 it. But that doesn't stop

NOTE Confidence: 0.9831543

00:44:06.745 --> 00:44:08.585 companies going to direct to

NOTE Confidence: 0.9831543

00:44:08.585 --> 00:44:09.085 consumers

NOTE Confidence: 0.9561233

00:44:09.465 --> 00:44:11.005 and selling things to consumers

NOTE Confidence: 0.9561233

00:44:11.225 --> 00:44:12.665 that therefore may or may

NOTE Confidence: 0.9561233

00:44:12.665 --> 00:44:13.705 not be warranted based on

NOTE Confidence: 0.9561233

00:44:13.705 --> 00:44:15.039 the clinical data. So this

NOTE Confidence: 0.9561233

00:44:15.039 --> 00:44:15.760 is where I put in

NOTE Confidence: 0.9561233

00:44:15.760 --> 00:44:17.299 some caution. What's my caution?

NOTE Confidence: 0.9561233

00:44:17.440 --> 00:44:18.400 Well, any of you could

NOTE Confidence: 0.9561233

00:44:18.400 --> 00:44:19.440 do this, and I do

NOTE Confidence: 0.9561233

00:44:19.440 --> 00:44:20.079 this every once in a

NOTE Confidence: 0.9561233

00:44:20.079 --> 00:44:21.200 while. Just start doing Google

NOTE Confidence: 0.9561233

00:44:21.200 --> 00:44:22.559 searches for polygenic risk scores,

NOTE Confidence: 0.9561233

00:44:22.559 --> 00:44:24.019 and you see lovely websites

NOTE Confidence: 0.9561233

00:44:24.160 --> 00:44:26.160 that are completely convincing that,

NOTE Confidence: 0.9561233

00:44:26.160 --> 00:44:27.119 yeah, maybe I should get

NOTE Confidence: 0.9561233

00:44:27.119 --> 00:44:28.000 that test and maybe the

NOTE Confidence: 0.9561233

00:44:28.000 --> 00:44:29.039 doctor doesn't wanna order it.

NOTE Confidence: 0.9561233

00:44:29.039 --> 00:44:30.045 I'll just get it myself

NOTE Confidence: 0.9561233

00:44:30.045 --> 00:44:30.765 and see what I'm at

NOTE Confidence: 0.9561233

00:44:30.765 --> 00:44:32.204 risk for. And that seems

NOTE Confidence: 0.9561233

00:44:32.204 --> 00:44:33.405 so good, and at first

NOTE Confidence: 0.9561233

00:44:33.405 --> 00:44:34.285 you say, oh, yeah, that's

NOTE Confidence: 0.9561233

00:44:34.285 --> 00:44:35.045 really good for two hundred

NOTE Confidence: 0.9561233

00:44:35.045 --> 00:44:36.364 and fifty nine dollars. But

NOTE Confidence: 0.9561233

00:44:36.364 --> 00:44:37.565 then you realize, it's just

NOTE Confidence: 0.9561233

00:44:37.565 --> 00:44:39.085 like Amazon. When you click

NOTE Confidence: 0.9561233

00:44:39.085 --> 00:44:40.525 there, they say, if you

NOTE Confidence: 0.9561233

00:44:40.525 --> 00:44:42.364 want that, maybe you also

NOTE Confidence: 0.9561233

00:44:42.364 --> 00:44:43.724 wanna get tested for other

NOTE Confidence: 0.9561233

00:44:43.724 --> 00:44:45.450 things, like whether you have

NOTE Confidence: 0.9561233

00:44:45.450 --> 00:44:46.810 your healthy weight or your

NOTE Confidence: 0.9561233

00:44:46.810 --> 00:44:48.489 nutrition or your personality type

NOTE Confidence: 0.9561233

00:44:48.489 --> 00:44:50.109 or your etcetera etcetera.

NOTE Confidence: 0.93248796

00:44:50.890 --> 00:44:52.650 Or here's another one. Looks

NOTE Confidence: 0.93248796

00:44:52.650 --> 00:44:54.650 great. Certainly very innocent until

NOTE Confidence: 0.93248796

00:44:54.650 --> 00:44:55.530 you see what else they're

NOTE Confidence: 0.93248796

00:44:55.530 --> 00:44:56.510 offering including

NOTE Confidence: 0.97056746

00:44:56.985 --> 00:44:59.065 finding your superpowers through DNA

NOTE Confidence: 0.97056746

00:44:59.065 --> 00:45:00.445 and perfecting your skin.

NOTE Confidence: 0.9615499

00:45:01.385 --> 00:45:03.705 This risks undermining the whole

NOTE Confidence: 0.9615499

00:45:03.705 --> 00:45:04.745 endeavor which is what makes

NOTE Confidence: 0.9615499

00:45:04.745 --> 00:45:05.705 me nervous. I think there's

NOTE Confidence: 0.9615499

00:45:05.705 --> 00:45:06.745 one more. Yeah. This I

NOTE Confidence: 0.9615499

00:45:06.745 --> 00:45:07.865 like. They even have a

NOTE Confidence: 0.9615499

00:45:07.865 --> 00:45:09.560 good metaphor to explain single

NOTE Confidence: 0.9615499

00:45:09.560 --> 00:45:11.320 gene disorders and polygenic risk.

NOTE Confidence: 0.9615499

00:45:11.320 --> 00:45:12.460 I love it. They're teaching.

NOTE Confidence: 0.9615499

00:45:12.600 --> 00:45:13.640 And then but you click

NOTE Confidence: 0.9615499

00:45:13.640 --> 00:45:14.920 through and you find out

NOTE Confidence: 0.9615499

00:45:14.920 --> 00:45:16.040 that they're talking about all

NOTE Confidence: 0.9615499

00:45:16.040 --> 00:45:17.820 sorts of crazy things, including

NOTE Confidence: 0.9932972

00:45:18.120 --> 00:45:19.800 DNA mindfulness. I don't even

NOTE Confidence: 0.9932972

00:45:19.800 --> 00:45:20.600 know what the hell that

NOTE Confidence: 0.9932972

00:45:20.600 --> 00:45:21.100 means.

NOTE Confidence: 0.9797208

00:45:21.885 --> 00:45:24.145 This risks undermining the enterprise

NOTE Confidence: 0.9797208

00:45:24.285 --> 00:45:25.725 completely, and I don't want

NOTE Confidence: 0.9797208

00:45:25.725 --> 00:45:27.165 that to happen by people

NOTE Confidence: 0.9797208

00:45:27.165 --> 00:45:28.125 clicking all this. And then

NOTE Confidence: 0.9797208

00:45:28.125 --> 00:45:29.485 eventually, when their clinician talks

NOTE Confidence: 0.9797208

00:45:29.485 --> 00:45:30.445 to them, they're gonna say,

NOTE Confidence: 0.9797208

00:45:30.445 --> 00:45:32.045 I didn't learn any mindfulness

NOTE Confidence: 0.9797208

00:45:32.045 --> 00:45:33.085 from the test. Forget this.

NOTE Confidence: 0.9797208

00:45:33.085 --> 00:45:34.145 I don't want my polygenic

NOTE Confidence: 0.9797208

00:45:34.285 --> 00:45:35.265 risk assessed.

NOTE Confidence: 0.99853516

00:45:36.030 --> 00:45:37.570 However, there is some optimism

NOTE Confidence: 0.9178292

00:45:37.950 --> 00:45:38.750 is that if we could

NOTE Confidence: 0.9178292

00:45:38.750 --> 00:45:40.110 just try to dampen out

NOTE Confidence: 0.9178292

00:45:40.110 --> 00:45:42.210 that that commercial noise

NOTE Confidence: 0.90527344

00:45:42.590 --> 00:45:43.710 that when you start to

NOTE Confidence: 0.90527344

00:45:43.710 --> 00:45:44.510 see a place that you

NOTE Confidence: 0.90527344

00:45:44.510 --> 00:45:46.110 actually could trust, and then

NOTE Confidence: 0.90527344

00:45:46.110 --> 00:45:47.070 you could start to build

NOTE Confidence: 0.90527344

00:45:47.070 --> 00:45:47.950 on that with some could

NOTE Confidence: 0.90527344

00:45:48.350 --> 00:45:49.170 very cautiously,

NOTE Confidence: 0.9409634

00:45:49.710 --> 00:45:50.750 then maybe we'll see this

NOTE Confidence: 0.9409634

00:45:50.750 --> 00:45:51.585 come to be. And I

NOTE Confidence: 0.9409634

00:45:51.744 --> 00:45:53.105 I Broad the Broad Clinical

NOTE Confidence: 0.9409634

00:45:53.105 --> 00:45:53.984 Labs, I have great respect

NOTE Confidence: 0.9409634

00:45:53.984 --> 00:45:55.185 for the people there. And

NOTE Confidence: 0.9409634

00:45:55.185 --> 00:45:56.785 very recently, they launched a

NOTE Confidence: 0.9409634

00:45:56.785 --> 00:45:57.744 test that they are now

NOTE Confidence: 0.9409634

00:45:57.744 --> 00:45:59.984 selling, for polygenic respites just

NOTE Confidence: 0.9409634

00:45:59.984 --> 00:46:00.885 for eight cardiovascular

NOTE Confidence: 0.9538574

00:46:01.185 --> 00:46:01.685 conditions.

NOTE Confidence: 0.98645425

00:46:02.065 --> 00:46:03.585 And as a result, we're

NOTE Confidence: 0.98645425

00:46:03.585 --> 00:46:05.025 starting to see people stick

NOTE Confidence: 0.98645425

00:46:05.025 --> 00:46:06.030 their toe in the water

NOTE Confidence: 0.98645425

00:46:06.110 --> 00:46:07.230 just around this domain. They

NOTE Confidence: 0.98645425

00:46:07.230 --> 00:46:08.030 said a lot of people

NOTE Confidence: 0.98645425

00:46:08.030 --> 00:46:09.310 are starting to order this.

NOTE Confidence: 0.98645425

00:46:09.310 --> 00:46:10.430 And then I thought this

NOTE Confidence: 0.98645425

00:46:10.430 --> 00:46:11.390 was pretty cool, and it's

NOTE Confidence: 0.98645425

00:46:11.390 --> 00:46:12.670 what we've been waiting for.

NOTE Confidence: 0.98645425

00:46:12.670 --> 00:46:13.790 And I think it signals

NOTE Confidence: 0.98645425

00:46:13.790 --> 00:46:15.230 a first step towards progress.

NOTE Confidence: 0.98645425

00:46:15.230 --> 00:46:17.090 In breaking news, very recently,

NOTE Confidence: 0.9727539

00:46:17.630 --> 00:46:19.330 the American College of Cardiology

NOTE Confidence: 0.9727539

00:46:19.550 --> 00:46:21.010 and the American Heart Association,

NOTE Confidence: 0.9994141

00:46:21.364 --> 00:46:23.625 who periodically put out the

NOTE Confidence: 0.9849243

00:46:24.005 --> 00:46:25.464 the the clinical guidelines,

NOTE Confidence: 0.8931071

00:46:26.484 --> 00:46:27.844 for working up patients with

NOTE Confidence: 0.8931071

00:46:27.844 --> 00:46:28.344 hyperlipidemia,

NOTE Confidence: 0.9603814

00:46:29.045 --> 00:46:30.484 put one out last month,

NOTE Confidence: 0.9603814

00:46:30.484 --> 00:46:31.545 and here's the paper,

NOTE Confidence: 0.9604076

00:46:31.924 --> 00:46:33.444 that where it's described. And

NOTE Confidence: 0.9604076

00:46:33.444 --> 00:46:34.805 it's very detailed if any

NOTE Confidence: 0.9604076

00:46:34.805 --> 00:46:35.525 of you have looked at

NOTE Confidence: 0.9604076

00:46:35.525 --> 00:46:36.405 this and lots and lots

NOTE Confidence: 0.9604076

00:46:36.405 --> 00:46:37.530 of things. But if you

NOTE Confidence: 0.9604076

00:46:37.530 --> 00:46:38.730 dig a little deeper into

NOTE Confidence: 0.9604076

00:46:38.730 --> 00:46:40.250 that paper, there is this

NOTE Confidence: 0.9604076

00:46:40.250 --> 00:46:42.090 table here where they actually

NOTE Confidence: 0.9604076

00:46:42.090 --> 00:46:43.310 start to talk about,

NOTE Confidence: 0.9527954

00:46:43.930 --> 00:46:45.710 I mean, high polygenic risk.

NOTE Confidence: 0.9527954

00:46:45.770 --> 00:46:46.730 And what I thought was

NOTE Confidence: 0.9527954

00:46:46.730 --> 00:46:47.770 even more exciting, and it

NOTE Confidence: 0.9527954

00:46:47.770 --> 00:46:48.730 was it's really a light

NOTE Confidence: 0.9527954

00:46:48.730 --> 00:46:49.795 touch. It's just you may

NOTE Confidence: 0.9527954

00:46:49.795 --> 00:46:50.835 wanna think about it and

NOTE Confidence: 0.9527954

00:46:50.835 --> 00:46:51.955 they gave some examples. It

NOTE Confidence: 0.9527954

00:46:51.955 --> 00:46:53.415 really wasn't a heavy guideline.

NOTE Confidence: 0.9573919

00:46:53.795 --> 00:46:55.155 But more importantly in my

NOTE Confidence: 0.9573919

00:46:55.155 --> 00:46:56.114 mind is they had a

NOTE Confidence: 0.9573919

00:46:56.114 --> 00:46:57.795 paragraph in the text where

NOTE Confidence: 0.9573919

00:46:57.795 --> 00:46:59.415 they actually talked about polygenic

NOTE Confidence: 0.9573919

00:46:59.555 --> 00:47:00.675 risk scores, which is the

NOTE Confidence: 0.9573919

00:47:00.675 --> 00:47:02.594 first step towards educating busy

NOTE Confidence: 0.9573919

00:47:02.594 --> 00:47:04.770 practicing physicians that in practice

NOTE Confidence: 0.9573919

00:47:04.770 --> 00:47:06.050 guidelines, we're gonna start to

NOTE Confidence: 0.9573919

00:47:06.050 --> 00:47:07.830 hear about polygenic risk.

NOTE Confidence: 0.99160814

00:47:08.130 --> 00:47:09.810 So I'm not overstating this

NOTE Confidence: 0.99160814

00:47:09.810 --> 00:47:10.690 as being the end all.

NOTE Confidence: 0.99160814

00:47:10.690 --> 00:47:11.650 I'm just saying it's the

NOTE Confidence: 0.99160814

00:47:11.650 --> 00:47:12.770 beginning of what I think

NOTE Confidence: 0.99160814

00:47:12.770 --> 00:47:14.710 is a very important progression

NOTE Confidence: 0.96400034

00:47:15.010 --> 00:47:16.450 as maybe we're gonna start

NOTE Confidence: 0.96400034

00:47:16.450 --> 00:47:17.735 to see the idea polygenic

NOTE Confidence: 0.96400034

00:47:17.835 --> 00:47:18.335 risk,

NOTE Confidence: 0.9948459

00:47:18.755 --> 00:47:20.855 come into clinical guidelines increasingly

NOTE Confidence: 0.9948459

00:47:21.075 --> 00:47:22.775 across different medical disciplines.

NOTE Confidence: 0.95730346

00:47:24.114 --> 00:47:25.955 So what I've told you

NOTE Confidence: 0.95730346

00:47:25.955 --> 00:47:27.555 about so far is what's

NOTE Confidence: 0.95730346

00:47:27.555 --> 00:47:28.435 going on in the last

NOTE Confidence: 0.95730346

00:47:28.435 --> 00:47:29.795 twenty three years with this

NOTE Confidence: 0.95730346

00:47:29.795 --> 00:47:31.475 vaguest idea of what genomic

NOTE Confidence: 0.95730346

00:47:31.475 --> 00:47:32.820 medicine was gonna be,

NOTE Confidence: 0.9777344

00:47:33.540 --> 00:47:35.560 to now actually bringing clarity.

NOTE Confidence: 0.984662

00:47:35.860 --> 00:47:37.000 We don't have a comprehensive

NOTE Confidence: 0.984662

00:47:37.140 --> 00:47:38.260 list. If you invite me

NOTE Confidence: 0.984662

00:47:38.260 --> 00:47:39.219 back here ten years from

NOTE Confidence: 0.984662

00:47:39.219 --> 00:47:40.100 now, I'm sure we'll have

NOTE Confidence: 0.984662

00:47:40.100 --> 00:47:41.300 a bigger list. But at

NOTE Confidence: 0.984662

00:47:41.300 --> 00:47:42.180 least for some of the

NOTE Confidence: 0.984662

00:47:42.180 --> 00:47:43.620 early examples, it is in

NOTE Confidence: 0.984662

00:47:43.620 --> 00:47:44.900 focus. We know what we

NOTE Confidence: 0.984662

00:47:44.900 --> 00:47:46.404 are doing. And we we've

NOTE Confidence: 0.984662

00:47:46.484 --> 00:47:47.605 we're learning so much from

NOTE Confidence: 0.984662

00:47:47.605 --> 00:47:49.204 these earliest examples, good, bad,

NOTE Confidence: 0.984662

00:47:49.204 --> 00:47:49.864 and other.

NOTE Confidence: 0.9934214

00:47:50.404 --> 00:47:51.924 That does lead to a

NOTE Confidence: 0.9934214

00:47:51.924 --> 00:47:53.444 question that I am frequently

NOTE Confidence: 0.9934214

00:47:53.444 --> 00:47:54.645 asked, and so I will

NOTE Confidence: 0.9934214

00:47:54.645 --> 00:47:55.924 just, right now, put it

NOTE Confidence: 0.9934214

00:47:55.924 --> 00:47:57.045 as part of my talk.

NOTE Confidence: 0.9934214

00:47:57.045 --> 00:47:58.005 What do I think is

NOTE Confidence: 0.9934214

00:47:58.005 --> 00:47:58.885 the next big thing in

NOTE Confidence: 0.9934214

00:47:58.885 --> 00:47:59.944 genomic medicine?

NOTE Confidence: 0.9851304

00:48:00.540 --> 00:48:01.820 And my views on this

NOTE Confidence: 0.9851304

00:48:01.820 --> 00:48:03.020 have actually changed over the

NOTE Confidence: 0.9851304

00:48:03.020 --> 00:48:04.060 last year, year and a

NOTE Confidence: 0.9851304

00:48:04.060 --> 00:48:05.580 half. And I would say

NOTE Confidence: 0.9851304

00:48:05.580 --> 00:48:06.860 that my number one answer

NOTE Confidence: 0.9851304

00:48:06.860 --> 00:48:07.739 now is that it's a

NOTE Confidence: 0.9851304

00:48:07.739 --> 00:48:09.820 seismic expansion of an established

NOTE Confidence: 0.9851304

00:48:09.820 --> 00:48:11.100 thing. What do I mean

NOTE Confidence: 0.9851304

00:48:11.100 --> 00:48:11.980 by that? Well, let me

NOTE Confidence: 0.9851304

00:48:11.980 --> 00:48:13.100 remind you, and I hinted

NOTE Confidence: 0.9851304

00:48:13.100 --> 00:48:13.844 at it earlier,

NOTE Confidence: 0.97168684

00:48:14.325 --> 00:48:15.364 is if we go back

NOTE Confidence: 0.97168684

00:48:15.364 --> 00:48:16.724 sixty years, there is a

NOTE Confidence: 0.97168684

00:48:16.724 --> 00:48:18.325 very rich history starting here

NOTE Confidence: 0.97168684

00:48:18.325 --> 00:48:19.285 in the US, but now

NOTE Confidence: 0.97168684

00:48:19.285 --> 00:48:21.125 around the world of prenatal

NOTE Confidence: 0.97168684

00:48:21.125 --> 00:48:22.645 genetic screening. And it started

NOTE Confidence: 0.97168684

00:48:22.645 --> 00:48:23.525 in the sixties, but it's

NOTE Confidence: 0.97168684

00:48:23.525 --> 00:48:25.125 progressed throughout. For those of

NOTE Confidence: 0.97168684

00:48:25.125 --> 00:48:26.405 you who don't know the

NOTE Confidence: 0.97168684

00:48:26.405 --> 00:48:26.905 details,

NOTE Confidence: 0.9842285

00:48:27.320 --> 00:48:28.280 just let me just remind

NOTE Confidence: 0.9842285

00:48:28.280 --> 00:48:29.480 you that at about day

NOTE Confidence: 0.9842285

00:48:29.480 --> 00:48:31.000 one or two in every

NOTE Confidence: 0.9842285

00:48:31.000 --> 00:48:32.460 state in the United States,

NOTE Confidence: 0.99790734

00:48:32.840 --> 00:48:34.920 a mean nurse comes into

NOTE Confidence: 0.99790734

00:48:34.920 --> 00:48:35.660 the nursery

NOTE Confidence: 0.98499477

00:48:35.960 --> 00:48:37.880 and nicely cleans off the

NOTE Confidence: 0.98499477

00:48:37.880 --> 00:48:39.080 heel of an of a

NOTE Confidence: 0.98499477

00:48:39.080 --> 00:48:40.700 newly born, infant

NOTE Confidence: 0.9520352

00:48:41.000 --> 00:48:42.525 and and sticks it with

NOTE Confidence: 0.9520352

00:48:42.525 --> 00:48:44.125 a little needle and then

NOTE Confidence: 0.9520352

00:48:44.125 --> 00:48:45.244 gets a little wipe there

NOTE Confidence: 0.9520352

00:48:45.244 --> 00:48:46.925 and then takes a drop

NOTE Confidence: 0.9520352

00:48:47.005 --> 00:48:48.685 several drops of blood and

NOTE Confidence: 0.9520352

00:48:48.685 --> 00:48:49.805 puts it on a piece

NOTE Confidence: 0.9520352

00:48:49.805 --> 00:48:51.085 of filter paper called a

NOTE Confidence: 0.9520352

00:48:51.085 --> 00:48:52.925 Guthrie card that gets sent

NOTE Confidence: 0.9520352

00:48:52.925 --> 00:48:54.125 off to the state lab

NOTE Confidence: 0.9520352

00:48:54.125 --> 00:48:55.165 in the United States. It's

NOTE Confidence: 0.9520352

00:48:55.165 --> 00:48:56.204 done state by state in

NOTE Confidence: 0.9520352

00:48:56.204 --> 00:48:57.700 the public health lab where

NOTE Confidence: 0.9520352

00:48:57.700 --> 00:48:59.400 they are screened for anywhere

NOTE Confidence: 0.9520352

00:48:59.700 --> 00:49:01.560 between forty and sixty

NOTE Confidence: 0.96027595

00:49:01.860 --> 00:49:03.700 rare genetic diseases, single gene

NOTE Confidence: 0.96027595

00:49:03.700 --> 00:49:05.060 disorders. Usually, I try to

NOTE Confidence: 0.96027595

00:49:05.140 --> 00:49:06.260 I does anybody know what

NOTE Confidence: 0.96027595

00:49:06.260 --> 00:49:07.380 Connecticut is? Usually, when I

NOTE Confidence: 0.96027595

00:49:07.380 --> 00:49:08.340 come somewhere, I always try

NOTE Confidence: 0.96027595

00:49:08.340 --> 00:49:09.460 to look up. Does anybody

NOTE Confidence: 0.96027595

00:49:09.460 --> 00:49:10.900 know what every state has

NOTE Confidence: 0.96027595

00:49:10.900 --> 00:49:11.955 a different number. I don't

NOTE Confidence: 0.96027595

00:49:11.955 --> 00:49:13.075 know if Connecticut's more like

NOTE Confidence: 0.96027595

00:49:13.075 --> 00:49:14.515 seventy or Connecticut's more like

NOTE Confidence: 0.96027595

00:49:14.515 --> 00:49:15.555 sixty or fifty. But in

NOTE Confidence: 0.96027595

00:49:15.555 --> 00:49:16.515 any case, it's somewhere in

NOTE Confidence: 0.96027595

00:49:16.515 --> 00:49:17.175 that range.

NOTE Confidence: 0.9537311

00:49:17.475 --> 00:49:18.675 And, of course, now you're

NOTE Confidence: 0.9537311

00:49:18.675 --> 00:49:20.114 thinking you're screening for fifty

NOTE Confidence: 0.9537311

00:49:20.114 --> 00:49:20.995 or sixty, but we know

NOTE Confidence: 0.9537311

00:49:20.995 --> 00:49:22.355 about six thousand. You could

NOTE Confidence: 0.9537311

00:49:22.355 --> 00:49:23.635 see that the mismatch is.

NOTE Confidence: 0.9537311

00:49:23.635 --> 00:49:24.594 So the idea is, why

NOTE Confidence: 0.9537311

00:49:24.594 --> 00:49:25.635 are we just doing sixty?

NOTE Confidence: 0.9537311

00:49:25.635 --> 00:49:26.435 Why don't we just do

NOTE Confidence: 0.9537311

00:49:26.435 --> 00:49:27.839 them all? Well, I can

NOTE Confidence: 0.9537311

00:49:27.839 --> 00:49:29.119 tell you that there always

NOTE Confidence: 0.9537311

00:49:29.119 --> 00:49:30.719 was early talk about just

NOTE Confidence: 0.9537311

00:49:30.719 --> 00:49:31.940 sequencing every newborn.

NOTE Confidence: 0.9468969

00:49:32.319 --> 00:49:33.119 And in fact, I can

NOTE Confidence: 0.9468969

00:49:33.119 --> 00:49:34.239 tell you that when the

NOTE Confidence: 0.9468969

00:49:34.239 --> 00:49:35.279 Genome Project in fact, I

NOTE Confidence: 0.9468969

00:49:35.279 --> 00:49:36.400 actually think of the congressional

NOTE Confidence: 0.9468969

00:49:36.400 --> 00:49:37.839 hearings in eighty nine. They

NOTE Confidence: 0.9468969

00:49:37.839 --> 00:49:38.799 talked about the ideas that

NOTE Confidence: 0.9468969

00:49:38.799 --> 00:49:39.440 if we could learn how

NOTE Confidence: 0.9468969

00:49:39.440 --> 00:49:40.640 to sequence the human genome,

NOTE Confidence: 0.9468969

00:49:40.640 --> 00:49:42.815 maybe one day, maybe one

NOTE Confidence: 0.9468969

00:49:43.035 --> 00:49:44.714 day, we would sequence every

NOTE Confidence: 0.9468969

00:49:44.714 --> 00:49:46.395 baby's genome at birth and

NOTE Confidence: 0.9468969

00:49:46.395 --> 00:49:47.195 we would make it part

NOTE Confidence: 0.9468969

00:49:47.195 --> 00:49:48.714 of their electronic record. It

NOTE Confidence: 0.9468969

00:49:48.714 --> 00:49:49.755 was very funny to say

NOTE Confidence: 0.9468969

00:49:49.755 --> 00:49:50.875 that back in nineteen ninety

NOTE Confidence: 0.9468969

00:49:50.875 --> 00:49:52.075 when the Human Genome Project

NOTE Confidence: 0.9468969

00:49:52.075 --> 00:49:53.515 began because Dave and I

NOTE Confidence: 0.9468969

00:49:53.515 --> 00:49:54.635 remember that back in nineteen

NOTE Confidence: 0.9468969

00:49:54.635 --> 00:49:56.075 ninety, the electronic record was

NOTE Confidence: 0.9468969

00:49:56.075 --> 00:49:57.375 all done handwritten

NOTE Confidence: 0.86602783

00:49:57.789 --> 00:49:59.009 paper was not electronic.

NOTE Confidence: 0.9596063

00:49:59.390 --> 00:50:00.269 The the the idea of

NOTE Confidence: 0.9596063

00:50:00.269 --> 00:50:01.390 sequencing a genome and having

NOTE Confidence: 0.9596063

00:50:01.390 --> 00:50:02.829 the genome sequence be carried

NOTE Confidence: 0.9596063

00:50:02.829 --> 00:50:03.950 forward with a patient for

NOTE Confidence: 0.9596063

00:50:03.950 --> 00:50:05.969 their life before electronic records

NOTE Confidence: 0.9596063

00:50:06.109 --> 00:50:06.829 was a bit of a

NOTE Confidence: 0.9596063

00:50:06.829 --> 00:50:08.269 joke. But by the time

NOTE Confidence: 0.9596063

00:50:08.269 --> 00:50:09.390 the Genome Project ended, it

NOTE Confidence: 0.9596063

00:50:09.390 --> 00:50:10.829 started to get serious attention

NOTE Confidence: 0.9596063

00:50:10.829 --> 00:50:12.269 with electronic health records, it

NOTE Confidence: 0.9596063

00:50:12.269 --> 00:50:13.745 became quite viable. And we

NOTE Confidence: 0.9596063

00:50:13.745 --> 00:50:15.185 already have the infrastructure for

NOTE Confidence: 0.9596063

00:50:15.185 --> 00:50:16.385 doing it. And so it's

NOTE Confidence: 0.9596063

00:50:16.385 --> 00:50:17.425 beginning to get a lot

NOTE Confidence: 0.9596063

00:50:17.425 --> 00:50:18.805 of attention right now.

NOTE Confidence: 0.9673462

00:50:19.344 --> 00:50:20.545 And I'm not the only

NOTE Confidence: 0.9673462

00:50:20.545 --> 00:50:21.505 one thinking it's getting a

NOTE Confidence: 0.9673462

00:50:21.505 --> 00:50:22.545 lot of attention. You know,

NOTE Confidence: 0.9673462

00:50:22.545 --> 00:50:23.985 even the popular press has

NOTE Confidence: 0.9673462

00:50:23.985 --> 00:50:25.205 thought about this idea.

NOTE Confidence: 0.9766376

00:50:25.869 --> 00:50:27.730 Time magazine got really audacious

NOTE Confidence: 0.9766376

00:50:27.950 --> 00:50:29.150 about twelve years ago. They

NOTE Confidence: 0.9766376

00:50:29.150 --> 00:50:30.290 had one of their futuristic

NOTE Confidence: 0.9766376

00:50:30.430 --> 00:50:31.710 issues where they talked about

NOTE Confidence: 0.9766376

00:50:31.710 --> 00:50:33.150 a series of domains, what

NOTE Confidence: 0.9766376

00:50:33.150 --> 00:50:34.030 was gonna happen in the

NOTE Confidence: 0.9766376

00:50:34.030 --> 00:50:35.469 future. And they made a

NOTE Confidence: 0.9766376

00:50:35.469 --> 00:50:37.010 claim in twenty fourteen

NOTE Confidence: 0.9328704

00:50:37.390 --> 00:50:38.830 that by twenty twenty five,

NOTE Confidence: 0.9328704

00:50:38.830 --> 00:50:40.715 which meant last year, everyone

NOTE Confidence: 0.9328704

00:50:40.715 --> 00:50:42.475 would get their DNA mapped.

NOTE Confidence: 0.9328704

00:50:42.475 --> 00:50:43.195 I wish I could have

NOTE Confidence: 0.9328704

00:50:43.195 --> 00:50:44.075 edited that. I would have

NOTE Confidence: 0.9328704

00:50:44.075 --> 00:50:44.895 said sequenced

NOTE Confidence: 0.9691162

00:50:45.195 --> 00:50:46.015 at birth.

NOTE Confidence: 0.9804715

00:50:46.395 --> 00:50:47.755 We didn't make that. Okay?

NOTE Confidence: 0.9804715

00:50:47.755 --> 00:50:48.975 But I like their audacity

NOTE Confidence: 0.9804715

00:50:49.195 --> 00:50:50.075 that they thought that was

NOTE Confidence: 0.9804715

00:50:50.075 --> 00:50:51.275 happening. But maybe they were

NOTE Confidence: 0.9804715

00:50:51.275 --> 00:50:52.235 off by some number of

NOTE Confidence: 0.9804715

00:50:52.235 --> 00:50:54.140 years because things are really

NOTE Confidence: 0.9804715

00:50:54.140 --> 00:50:55.500 starting to heat up now

NOTE Confidence: 0.9804715

00:50:55.500 --> 00:50:56.940 in this arena. And there

NOTE Confidence: 0.9804715

00:50:56.940 --> 00:50:58.140 is a lot of activity

NOTE Confidence: 0.9804715

00:50:58.140 --> 00:50:59.340 and a lot of research

NOTE Confidence: 0.9804715

00:50:59.340 --> 00:51:00.860 going on. And all you

NOTE Confidence: 0.9804715

00:51:00.860 --> 00:51:02.060 have to do is is

NOTE Confidence: 0.9804715

00:51:02.220 --> 00:51:02.940 and that's why I put

NOTE Confidence: 0.9804715

00:51:02.940 --> 00:51:03.740 it on my watch list

NOTE Confidence: 0.9804715

00:51:03.740 --> 00:51:04.460 of what I think is

NOTE Confidence: 0.9804715

00:51:04.460 --> 00:51:05.915 happening. There is just so

NOTE Confidence: 0.9804715

00:51:05.915 --> 00:51:07.515 many publications coming out where

NOTE Confidence: 0.9804715

00:51:07.515 --> 00:51:08.655 they are doing pilots

NOTE Confidence: 0.94308895

00:51:09.195 --> 00:51:10.555 all around the world of

NOTE Confidence: 0.94308895

00:51:10.555 --> 00:51:12.555 sequencing healthy newborns, not this

NOTE Confidence: 0.94308895

00:51:12.635 --> 00:51:13.755 the ill ones, the healthy

NOTE Confidence: 0.94308895

00:51:13.755 --> 00:51:14.955 ones, seeing what they could

NOTE Confidence: 0.94308895

00:51:14.955 --> 00:51:15.835 learn, seeing how you could

NOTE Confidence: 0.94308895

00:51:15.835 --> 00:51:17.114 operational, dealing with all the

NOTE Confidence: 0.94308895

00:51:17.114 --> 00:51:17.614 logistics.

NOTE Confidence: 0.9515564

00:51:17.995 --> 00:51:19.440 In fact, there are so

NOTE Confidence: 0.9515564

00:51:19.440 --> 00:51:21.600 many worldwide studies going on

NOTE Confidence: 0.9515564

00:51:21.600 --> 00:51:22.640 that a few years ago

NOTE Confidence: 0.9515564

00:51:22.640 --> 00:51:24.820 an international organization called ICONS,

NOTE Confidence: 0.9269165

00:51:25.600 --> 00:51:27.619 International Consortium of Newborn Sequencing

NOTE Confidence: 0.9269165

00:51:27.680 --> 00:51:29.119 got established, and every one

NOTE Confidence: 0.9269165

00:51:29.119 --> 00:51:30.080 of those little black dots

NOTE Confidence: 0.9269165

00:51:30.080 --> 00:51:31.440 are where a major study

NOTE Confidence: 0.9269165

00:51:31.440 --> 00:51:32.974 is going on of of

NOTE Confidence: 0.9269165

00:51:32.974 --> 00:51:34.795 of of healthy newborn sequencing.

NOTE Confidence: 0.9627838

00:51:35.255 --> 00:51:36.375 Some of the most prominent

NOTE Confidence: 0.9627838

00:51:36.375 --> 00:51:37.895 of these, there's multiple prominent

NOTE Confidence: 0.9627838

00:51:37.895 --> 00:51:38.775 ones, but you may have

NOTE Confidence: 0.9627838

00:51:38.775 --> 00:51:40.055 heard of the generation study

NOTE Confidence: 0.9627838

00:51:40.055 --> 00:51:41.335 in the UK or the

NOTE Confidence: 0.9627838

00:51:41.335 --> 00:51:42.535 guardian study here in the

NOTE Confidence: 0.9627838

00:51:42.535 --> 00:51:43.434 United States.

NOTE Confidence: 0.9377056

00:51:43.974 --> 00:51:45.494 The generation study in the

NOTE Confidence: 0.9377056

00:51:45.494 --> 00:51:47.250 UK has so far along

NOTE Confidence: 0.9377056

00:51:47.250 --> 00:51:48.450 and they're so excited about

NOTE Confidence: 0.9377056

00:51:48.450 --> 00:51:50.310 it that last year,

NOTE Confidence: 0.9884288

00:51:50.690 --> 00:51:52.770 the UK declared that by

NOTE Confidence: 0.9884288

00:51:52.770 --> 00:51:54.130 twenty thirty five, they're gonna

NOTE Confidence: 0.9884288

00:51:54.130 --> 00:51:55.570 sequence every baby born in

NOTE Confidence: 0.9884288

00:51:55.570 --> 00:51:57.250 the UK. And other countries

NOTE Confidence: 0.9884288

00:51:57.250 --> 00:51:58.210 are now starting to talk

NOTE Confidence: 0.9884288

00:51:58.210 --> 00:51:59.410 in a similar way. So

NOTE Confidence: 0.9884288

00:51:59.410 --> 00:52:00.610 they've really put down the

NOTE Confidence: 0.9884288

00:52:00.610 --> 00:52:02.405 marker. And as a result

NOTE Confidence: 0.9884288

00:52:02.405 --> 00:52:03.445 of that, even here in

NOTE Confidence: 0.9884288

00:52:03.445 --> 00:52:04.425 the United States,

NOTE Confidence: 0.9387207

00:52:04.965 --> 00:52:06.585 more attention is being spent.

NOTE Confidence: 0.9387207

00:52:06.645 --> 00:52:08.005 And the project that I

NOTE Confidence: 0.9387207

00:52:08.005 --> 00:52:09.125 tweaked a little before I

NOTE Confidence: 0.9387207

00:52:09.125 --> 00:52:10.105 left and finally,

NOTE Confidence: 0.9644857

00:52:10.565 --> 00:52:11.685 it got launched after I

NOTE Confidence: 0.9644857

00:52:11.685 --> 00:52:12.805 left NIH. It's a brand

NOTE Confidence: 0.9644857

00:52:12.885 --> 00:52:13.765 oh, I'm sorry. Before I

NOTE Confidence: 0.9644857

00:52:13.765 --> 00:52:14.805 get to that one, other

NOTE Confidence: 0.9644857

00:52:14.805 --> 00:52:16.405 breaking stories. Thailand has a

NOTE Confidence: 0.9644857

00:52:16.405 --> 00:52:18.060 major program. Denmark has a

NOTE Confidence: 0.9644857

00:52:18.060 --> 00:52:20.080 major program of newborn sequencing.

NOTE Confidence: 0.9644857

00:52:20.300 --> 00:52:21.340 But then I was telling

NOTE Confidence: 0.9644857

00:52:21.340 --> 00:52:22.460 you about the program that

NOTE Confidence: 0.9644857

00:52:22.460 --> 00:52:23.980 just got launched earlier this

NOTE Confidence: 0.9644857

00:52:23.980 --> 00:52:25.420 year at NIH called the

NOTE Confidence: 0.9644857

00:52:25.420 --> 00:52:27.360 Beacon study, where they are

NOTE Confidence: 0.9828003

00:52:27.660 --> 00:52:29.340 specifically working with the state

NOTE Confidence: 0.9828003

00:52:29.340 --> 00:52:30.945 health labs to try to

NOTE Confidence: 0.9828003

00:52:30.945 --> 00:52:32.785 move forward at making that

NOTE Confidence: 0.9828003

00:52:32.785 --> 00:52:34.565 transition from forty to fifty,

NOTE Confidence: 0.9564296

00:52:35.025 --> 00:52:36.305 diseases to be screened for.

NOTE Confidence: 0.9564296

00:52:36.305 --> 00:52:37.025 But what would it look

NOTE Confidence: 0.9564296

00:52:37.025 --> 00:52:37.905 like if a state lab

NOTE Confidence: 0.9564296

00:52:37.905 --> 00:52:39.285 started to do genome sequencing?

NOTE Confidence: 0.9564296

00:52:39.505 --> 00:52:40.945 So a big consortium funded

NOTE Confidence: 0.9564296

00:52:40.945 --> 00:52:41.765 by the NIH.

NOTE Confidence: 0.9876228

00:52:42.385 --> 00:52:44.085 Oh, and then there's politics

NOTE Confidence: 0.9876228

00:52:44.225 --> 00:52:45.665 getting involved in it. In

NOTE Confidence: 0.9876228

00:52:45.665 --> 00:52:46.680 fact, if if any of

NOTE Confidence: 0.9876228

00:52:46.680 --> 00:52:47.880 you said, what is the

NOTE Confidence: 0.9876228

00:52:47.880 --> 00:52:50.119 most progressive state when it

NOTE Confidence: 0.9876228

00:52:50.119 --> 00:52:52.119 comes to committing to genome

NOTE Confidence: 0.9876228

00:52:52.119 --> 00:52:53.339 sequencing of newborns,

NOTE Confidence: 0.99078923

00:52:53.800 --> 00:52:55.560 you would never think that

NOTE Confidence: 0.99078923

00:52:55.560 --> 00:52:57.099 I would say the word

NOTE Confidence: 0.99078923

00:52:57.239 --> 00:52:57.739 Florida.

NOTE Confidence: 0.99423826

00:52:58.119 --> 00:52:59.320 But it turns out that

NOTE Confidence: 0.99423826

00:52:59.320 --> 00:53:01.795 it's Florida. Why? Because one

NOTE Confidence: 0.99423826

00:53:01.795 --> 00:53:03.175 member of the state legislature

NOTE Confidence: 0.94260406

00:53:03.635 --> 00:53:05.075 had a child who died

NOTE Confidence: 0.94260406

00:53:05.075 --> 00:53:06.675 of Tay Sachs disease. His

NOTE Confidence: 0.94260406

00:53:06.675 --> 00:53:07.635 name is Adam Anderson. You

NOTE Confidence: 0.94260406

00:53:07.635 --> 00:53:08.355 can read about him or

NOTE Confidence: 0.94260406

00:53:08.355 --> 00:53:09.975 see interviews in the news.

NOTE Confidence: 0.94260406

00:53:10.035 --> 00:53:11.315 He they died he was

NOTE Confidence: 0.94260406

00:53:11.315 --> 00:53:12.835 not Ashkenazi Jewish nor was

NOTE Confidence: 0.94260406

00:53:12.835 --> 00:53:14.195 his wife. And the child

NOTE Confidence: 0.94260406

00:53:14.195 --> 00:53:14.695 died

NOTE Confidence: 0.96817756

00:53:15.219 --> 00:53:16.660 of Tay Sachs disease at

NOTE Confidence: 0.96817756

00:53:16.660 --> 00:53:18.100 age four, and they went

NOTE Confidence: 0.96817756

00:53:18.100 --> 00:53:19.560 under a three year diagnostic

NOTE Confidence: 0.96817756

00:53:19.620 --> 00:53:21.620 odyssey missing every opportunity to

NOTE Confidence: 0.96817756

00:53:21.620 --> 00:53:23.140 enroll in clinical trials because

NOTE Confidence: 0.96817756

00:53:23.140 --> 00:53:23.860 you had to be much

NOTE Confidence: 0.96817756

00:53:23.860 --> 00:53:24.660 younger to be in a

NOTE Confidence: 0.96817756

00:53:24.660 --> 00:53:25.940 clinical trial for Tay Sachs.

NOTE Confidence: 0.96817756

00:53:25.940 --> 00:53:27.219 And he just said, why

NOTE Confidence: 0.96817756

00:53:27.219 --> 00:53:28.420 are parents not being given

NOTE Confidence: 0.96817756

00:53:28.420 --> 00:53:29.775 the ability to sequence their

NOTE Confidence: 0.96817756

00:53:29.775 --> 00:53:31.135 patient their child's genome at

NOTE Confidence: 0.96817756

00:53:31.135 --> 00:53:32.335 birth? We should figure out

NOTE Confidence: 0.96817756

00:53:32.335 --> 00:53:32.895 a way to do this

NOTE Confidence: 0.96817756

00:53:32.895 --> 00:53:33.694 and at least give them

NOTE Confidence: 0.96817756

00:53:33.694 --> 00:53:35.295 the option. They got passed

NOTE Confidence: 0.96817756

00:53:35.295 --> 00:53:36.815 in Florida, the Florida Genetic

NOTE Confidence: 0.96817756

00:53:36.815 --> 00:53:37.795 Sunshine Act,

NOTE Confidence: 0.96214044

00:53:38.255 --> 00:53:39.694 passed in Florida by a

NOTE Confidence: 0.96214044

00:53:39.694 --> 00:53:41.055 unanimous vote of the state

NOTE Confidence: 0.96214044

00:53:41.055 --> 00:53:42.974 legislature, signed into law by

NOTE Confidence: 0.96214044

00:53:42.974 --> 00:53:44.770 by governor DeSantis and is

NOTE Confidence: 0.96214044

00:53:44.770 --> 00:53:46.529 the most progressive ambition. They

NOTE Confidence: 0.96214044

00:53:46.529 --> 00:53:47.809 haven't committed fully, but they

NOTE Confidence: 0.96214044

00:53:47.809 --> 00:53:49.170 are now doing a pilot.

NOTE Confidence: 0.96214044

00:53:49.170 --> 00:53:50.609 It's the most ambitious pilot

NOTE Confidence: 0.96214044

00:53:50.609 --> 00:53:51.969 of any given state. So

NOTE Confidence: 0.96214044

00:53:51.969 --> 00:53:53.809 Florida's leading kind of embarrasses

NOTE Confidence: 0.96214044

00:53:53.809 --> 00:53:54.770 Connecticut as far as I'm

NOTE Confidence: 0.96214044

00:53:54.770 --> 00:53:55.650 concerned, but I say that

NOTE Confidence: 0.96214044

00:53:55.650 --> 00:53:56.505 every state I visit.

NOTE Confidence: 0.95736694

00:53:57.864 --> 00:53:59.085 There's a lot of momentum

NOTE Confidence: 0.95736694

00:53:59.305 --> 00:54:00.204 in this arena,

NOTE Confidence: 0.98488945

00:54:00.585 --> 00:54:02.184 and I I I'd also

NOTE Confidence: 0.98488945

00:54:02.184 --> 00:54:03.144 just like to share a

NOTE Confidence: 0.98488945

00:54:03.144 --> 00:54:04.585 clip. So there's another green

NOTE Confidence: 0.98488945

00:54:04.585 --> 00:54:05.864 in the genomics world called

NOTE Confidence: 0.98488945

00:54:05.864 --> 00:54:07.325 Robert Green. We're not related.

NOTE Confidence: 0.98488945

00:54:07.545 --> 00:54:08.585 We we we,

NOTE Confidence: 0.96765745

00:54:08.984 --> 00:54:09.944 he he I just like

NOTE Confidence: 0.96765745

00:54:09.944 --> 00:54:10.664 a lot of the things

NOTE Confidence: 0.96765745

00:54:10.664 --> 00:54:11.464 he says and how he

NOTE Confidence: 0.96765745

00:54:11.464 --> 00:54:12.390 says it. He is the

NOTE Confidence: 0.96765745

00:54:12.390 --> 00:54:13.829 leader of the beacons program

NOTE Confidence: 0.96765745

00:54:13.829 --> 00:54:14.710 that I just told you

NOTE Confidence: 0.96765745

00:54:14.710 --> 00:54:16.069 about, and I just like

NOTE Confidence: 0.96765745

00:54:16.069 --> 00:54:17.190 how he brings us into

NOTE Confidence: 0.96765745

00:54:17.190 --> 00:54:18.390 the future in this TED

NOTE Confidence: 0.96765745

00:54:18.390 --> 00:54:19.069 Talk. If you wanna listen

NOTE Confidence: 0.96765745

00:54:19.069 --> 00:54:19.589 to the whole thing, it's

NOTE Confidence: 0.96765745

00:54:19.589 --> 00:54:20.710 fifteen minutes. I'm just gonna

NOTE Confidence: 0.96765745

00:54:20.710 --> 00:54:21.589 show you a one minute

NOTE Confidence: 0.96765745

00:54:21.589 --> 00:54:23.109 clip. But if we really

NOTE Confidence: 0.96765745

00:54:23.109 --> 00:54:24.390 want to invent the future,

NOTE Confidence: 0.96765745

00:54:24.390 --> 00:54:25.930 we've gotta do something different.

NOTE Confidence: 0.92762977

00:54:26.335 --> 00:54:27.375 We really want to invent

NOTE Confidence: 0.92762977

00:54:27.375 --> 00:54:29.135 the future, we've gotta realize

NOTE Confidence: 0.92762977

00:54:29.135 --> 00:54:30.755 that a child's DNA

NOTE Confidence: 0.99017334

00:54:31.455 --> 00:54:33.635 doesn't change over time,

NOTE Confidence: 0.9996745

00:54:33.935 --> 00:54:34.915 but the science

NOTE Confidence: 0.9984375

00:54:35.215 --> 00:54:36.675 is changing all the time.

NOTE Confidence: 0.9770372

00:54:36.975 --> 00:54:38.094 And so what that means

NOTE Confidence: 0.9770372

00:54:38.094 --> 00:54:39.695 is we should sequence your

NOTE Confidence: 0.9770372

00:54:39.695 --> 00:54:41.690 child's DNA, and we should

NOTE Confidence: 0.9770372

00:54:41.750 --> 00:54:43.130 revisit and reanalyze

NOTE Confidence: 1

00:54:43.430 --> 00:54:44.250 that DNA

NOTE Confidence: 0.98168945

00:54:44.710 --> 00:54:46.790 over and over again to

NOTE Confidence: 0.98168945

00:54:46.790 --> 00:54:47.290 truly

NOTE Confidence: 0.97112167

00:54:48.469 --> 00:54:50.390 create the dream of genome

NOTE Confidence: 0.97112167

00:54:50.390 --> 00:54:51.450 informed medicine.

NOTE Confidence: 0.9908447

00:54:51.910 --> 00:54:53.589 Because each and every year,

NOTE Confidence: 0.9908447

00:54:53.589 --> 00:54:55.130 there will be new insights

NOTE Confidence: 0.9991455

00:54:55.594 --> 00:54:57.055 and new treatments available.

NOTE Confidence: 0.9619751

00:54:58.714 --> 00:55:00.795 Well, this isn't offered anywhere

NOTE Confidence: 0.9619751

00:55:00.795 --> 00:55:01.535 in the world,

NOTE Confidence: 0.9988356

00:55:02.154 --> 00:55:03.194 but I'm happy to tell

NOTE Confidence: 0.9988356

00:55:03.194 --> 00:55:04.635 you that we are trying

NOTE Confidence: 0.9988356

00:55:04.635 --> 00:55:05.694 to build this.

NOTE Confidence: 0.99104816

00:55:06.234 --> 00:55:07.135 We are building

NOTE Confidence: 0.9973958

00:55:07.674 --> 00:55:09.214 an AI enhanced

NOTE Confidence: 0.9996745

00:55:09.780 --> 00:55:11.400 digital health platform

NOTE Confidence: 0.94013673

00:55:12.020 --> 00:55:13.960 so that you, your grandchildren,

NOTE Confidence: 0.9998779

00:55:14.420 --> 00:55:16.440 your children, your pediatricians,

NOTE Confidence: 0.89404297

00:55:16.739 --> 00:55:17.960 your health care centers,

NOTE Confidence: 0.9992676

00:55:18.500 --> 00:55:19.239 your employers,

NOTE Confidence: 0.9995117

00:55:20.100 --> 00:55:20.840 your nations

NOTE Confidence: 0.90107423

00:55:21.540 --> 00:55:23.239 can do this at scale.

NOTE Confidence: 0.9712372

00:55:23.925 --> 00:55:25.045 It's gonna take a certain

NOTE Confidence: 0.9712372

00:55:25.045 --> 00:55:26.645 amount of courage to change

NOTE Confidence: 0.9712372

00:55:26.645 --> 00:55:28.165 the way we think about

NOTE Confidence: 0.9712372

00:55:28.165 --> 00:55:28.665 disease,

NOTE Confidence: 1

00:55:29.045 --> 00:55:29.864 to embrace

NOTE Confidence: 1

00:55:30.245 --> 00:55:31.065 the knowledge

NOTE Confidence: 0.99902344

00:55:31.364 --> 00:55:32.025 of risk

NOTE Confidence: 0.9057617

00:55:32.645 --> 00:55:33.385 in order

NOTE Confidence: 0.98536134

00:55:34.085 --> 00:55:36.210 to preserve our health rather

NOTE Confidence: 0.98536134

00:55:36.210 --> 00:55:37.489 than waiting for us and

NOTE Confidence: 0.98536134

00:55:37.489 --> 00:55:39.170 our children to get sick

NOTE Confidence: 0.98536134

00:55:39.170 --> 00:55:40.530 and treating them there. But

NOTE Confidence: 0.98536134

00:55:40.530 --> 00:55:41.750 if we can do this,

NOTE Confidence: 0.99902344

00:55:42.530 --> 00:55:44.150 if we can embrace this,

NOTE Confidence: 0.9965376

00:55:44.770 --> 00:55:46.450 we can save millions of

NOTE Confidence: 0.9965376

00:55:46.450 --> 00:55:48.130 lives and usher in an

NOTE Confidence: 0.9965376

00:55:48.130 --> 00:55:48.630 entirely

NOTE Confidence: 1

00:55:49.170 --> 00:55:49.910 new era

NOTE Confidence: 0.97546387

00:55:50.325 --> 00:55:51.864 of genome inspired medicine.

NOTE Confidence: 0.9995117

00:55:52.244 --> 00:55:52.984 Thank you.

NOTE Confidence: 0.9746979

00:55:54.005 --> 00:55:55.205 So I I like especially

NOTE Confidence: 0.9746979

00:55:55.205 --> 00:55:56.325 how he talks about being

NOTE Confidence: 0.9746979

00:55:56.325 --> 00:55:57.445 courageous. I also think it

NOTE Confidence: 0.9746979

00:55:57.445 --> 00:55:58.325 just I think we're gonna

NOTE Confidence: 0.9746979

00:55:58.325 --> 00:55:59.285 start taking this as a

NOTE Confidence: 0.9746979

00:55:59.285 --> 00:56:01.125 very practical way. You know,

NOTE Confidence: 0.9746979

00:56:01.125 --> 00:56:02.085 I'm I'm on airplanes a

NOTE Confidence: 0.9746979

00:56:02.085 --> 00:56:03.570 lot these days for Illumina,

NOTE Confidence: 0.9746979

00:56:03.570 --> 00:56:04.850 and I was I suddenly

NOTE Confidence: 0.9746979

00:56:04.850 --> 00:56:06.050 realized that I would not

NOTE Confidence: 0.9746979

00:56:06.050 --> 00:56:07.590 wanna get on any airplane

NOTE Confidence: 0.9746979

00:56:07.810 --> 00:56:09.330 if the mechanic taking care

NOTE Confidence: 0.9746979

00:56:09.330 --> 00:56:10.770 of that plane and doing

NOTE Confidence: 0.9746979

00:56:10.770 --> 00:56:11.570 service on a plane didn't

NOTE Confidence: 0.9746979

00:56:11.570 --> 00:56:12.930 have a blueprint in front

NOTE Confidence: 0.9746979

00:56:12.930 --> 00:56:13.890 of them. And I just

NOTE Confidence: 0.9746979

00:56:13.890 --> 00:56:15.435 wonder if part of what

NOTE Confidence: 0.9746979

00:56:15.435 --> 00:56:16.715 we're all thinking about in

NOTE Confidence: 0.9746979

00:56:16.715 --> 00:56:17.215 genomics

NOTE Confidence: 0.9624162

00:56:17.594 --> 00:56:18.635 is that are we heading

NOTE Confidence: 0.9624162

00:56:18.635 --> 00:56:19.675 towards a future where you're

NOTE Confidence: 0.9624162

00:56:19.915 --> 00:56:21.195 this is how Adam Anderson

NOTE Confidence: 0.9624162

00:56:21.195 --> 00:56:22.555 feels. In the future, they're

NOTE Confidence: 0.9624162

00:56:22.555 --> 00:56:23.435 just not gonna want a

NOTE Confidence: 0.9624162

00:56:23.435 --> 00:56:24.635 doctor taking care of you

NOTE Confidence: 0.9624162

00:56:24.635 --> 00:56:26.075 or your child without having

NOTE Confidence: 0.9624162

00:56:26.075 --> 00:56:27.275 a genome sequence in front

NOTE Confidence: 0.9624162

00:56:27.275 --> 00:56:28.235 of them when we get

NOTE Confidence: 0.9624162

00:56:28.235 --> 00:56:29.295 to the point of operationalizing

NOTE Confidence: 0.9624162

00:56:29.594 --> 00:56:30.415 all that information.

NOTE Confidence: 0.9986328

00:56:30.780 --> 00:56:31.820 So I I think our

NOTE Confidence: 0.9986328

00:56:31.820 --> 00:56:33.340 minds might change over time

NOTE Confidence: 0.9986328

00:56:33.340 --> 00:56:34.219 in a way that will

NOTE Confidence: 0.9986328

00:56:34.219 --> 00:56:36.080 make this very comfortable. However,

NOTE Confidence: 0.95365494

00:56:36.460 --> 00:56:37.660 I'm not saying any of

NOTE Confidence: 0.95365494

00:56:37.660 --> 00:56:38.620 this is easy because the

NOTE Confidence: 0.95365494

00:56:38.700 --> 00:56:39.660 what I'm talking about in

NOTE Confidence: 0.95365494

00:56:39.660 --> 00:56:41.600 the future is a circumstance

NOTE Confidence: 0.95365494

00:56:41.739 --> 00:56:42.780 like this where every child

NOTE Confidence: 0.95365494

00:56:42.780 --> 00:56:43.900 walking into a hospital or

NOTE Confidence: 0.95365494

00:56:43.900 --> 00:56:45.260 clinical have their genome sequence

NOTE Confidence: 0.95365494

00:56:45.260 --> 00:56:46.705 in hand. But everybody's happy

NOTE Confidence: 0.95365494

00:56:46.705 --> 00:56:48.145 here. If we don't do

NOTE Confidence: 0.95365494

00:56:48.145 --> 00:56:49.265 this well, if we don't

NOTE Confidence: 0.95365494

00:56:49.265 --> 00:56:50.385 figure out how to implement

NOTE Confidence: 0.95365494

00:56:50.385 --> 00:56:51.265 this, which is why we're

NOTE Confidence: 0.95365494

00:56:51.265 --> 00:56:52.545 doing all of these studies,

NOTE Confidence: 0.95365494

00:56:52.545 --> 00:56:53.344 is to figure out the

NOTE Confidence: 0.95365494

00:56:53.344 --> 00:56:55.265 logistics and the ethics and

NOTE Confidence: 0.95365494

00:56:55.265 --> 00:56:56.385 the and and all the

NOTE Confidence: 0.95365494

00:56:56.385 --> 00:56:57.285 social dimensions.

NOTE Confidence: 0.97185725

00:56:57.585 --> 00:56:59.040 If we screw this up,

NOTE Confidence: 0.97185725

00:56:59.200 --> 00:57:00.160 this is what it'll be

NOTE Confidence: 0.97185725

00:57:00.160 --> 00:57:00.880 like, where we'll give them

NOTE Confidence: 0.97185725

00:57:00.880 --> 00:57:02.320 a tsunami of information, and

NOTE Confidence: 0.97185725

00:57:02.320 --> 00:57:03.600 we'll terrify the family, we'll

NOTE Confidence: 0.97185725

00:57:03.600 --> 00:57:04.719 terrify the patients, and we'll

NOTE Confidence: 0.97185725

00:57:04.719 --> 00:57:05.860 terrify the clinicians.

NOTE Confidence: 0.9805083

00:57:06.239 --> 00:57:07.540 We can't let that happen,

NOTE Confidence: 0.9805083

00:57:07.680 --> 00:57:08.560 but I can tell you

NOTE Confidence: 0.9805083

00:57:08.560 --> 00:57:09.860 there's a lot of attention

NOTE Confidence: 0.9805083

00:57:10.000 --> 00:57:11.300 being given to the bioethical

NOTE Confidence: 0.9805083

00:57:11.440 --> 00:57:13.280 issues associated with newborn sequencing,

NOTE Confidence: 0.9805083

00:57:13.280 --> 00:57:14.385 and that's the reason why

NOTE Confidence: 0.9805083

00:57:14.465 --> 00:57:15.925 these studies and these consortiums

NOTE Confidence: 0.9805083

00:57:15.985 --> 00:57:16.645 have formed.

NOTE Confidence: 0.99053156

00:57:17.505 --> 00:57:18.945 So let me just point

NOTE Confidence: 0.99053156

00:57:18.945 --> 00:57:20.465 out that we're celebrating the

NOTE Confidence: 0.99053156

00:57:20.465 --> 00:57:22.305 arrival of genomic medicine, and

NOTE Confidence: 0.99053156

00:57:22.305 --> 00:57:23.025 we have a lot of

NOTE Confidence: 0.99053156

00:57:23.025 --> 00:57:24.085 reason to celebrate.

NOTE Confidence: 0.981393

00:57:24.545 --> 00:57:26.545 But nothing about what I've

NOTE Confidence: 0.981393

00:57:26.545 --> 00:57:27.825 described to you has been

NOTE Confidence: 0.981393

00:57:27.825 --> 00:57:29.445 linear. It's really complicated.

NOTE Confidence: 0.9665952

00:57:29.840 --> 00:57:31.220 Lots of twists and turns,

NOTE Confidence: 0.9665952

00:57:31.280 --> 00:57:32.320 and we've all along the

NOTE Confidence: 0.9665952

00:57:32.320 --> 00:57:33.600 way faced lots of challenges.

NOTE Confidence: 0.9665952

00:57:33.600 --> 00:57:34.480 And so I just wanna

NOTE Confidence: 0.9665952

00:57:34.480 --> 00:57:35.380 spend two minutes

NOTE Confidence: 0.9874589

00:57:35.920 --> 00:57:37.520 reminding you that I am

NOTE Confidence: 0.9874589

00:57:37.520 --> 00:57:38.960 well aware of the fact

NOTE Confidence: 0.9874589

00:57:38.960 --> 00:57:40.720 that my enthusiasm is also

NOTE Confidence: 0.9874589

00:57:40.720 --> 00:57:41.700 met with a recognition

NOTE Confidence: 0.95656174

00:57:42.255 --> 00:57:43.535 that we have huge challenges

NOTE Confidence: 0.95656174

00:57:43.535 --> 00:57:44.255 ahead, and I could have

NOTE Confidence: 0.95656174

00:57:44.255 --> 00:57:45.214 spent an hour talking about

NOTE Confidence: 0.95656174

00:57:45.214 --> 00:57:46.734 the challenges. I will just

NOTE Confidence: 0.95656174

00:57:46.734 --> 00:57:48.494 briefly point out two major

NOTE Confidence: 0.95656174

00:57:48.494 --> 00:57:48.994 challenges

NOTE Confidence: 0.97753906

00:57:49.375 --> 00:57:50.434 that I oversimplified

NOTE Confidence: 0.9967448

00:57:50.974 --> 00:57:52.275 what it's like to actually

NOTE Confidence: 0.9967448

00:57:52.414 --> 00:57:52.914 analyze

NOTE Confidence: 0.9565255

00:57:53.375 --> 00:57:54.674 a a a patient's genome.

NOTE Confidence: 0.9565255

00:57:54.930 --> 00:57:56.210 I fully get that this

NOTE Confidence: 0.9565255

00:57:56.210 --> 00:57:57.670 was profoundly an oversimplification.

NOTE Confidence: 0.9733815

00:57:58.130 --> 00:58:00.130 I completely acknowledge that we

NOTE Confidence: 0.9733815

00:58:00.130 --> 00:58:01.490 could sequence any patient at

NOTE Confidence: 0.9733815

00:58:01.490 --> 00:58:03.410 Yale Hospital. We could read

NOTE Confidence: 0.9733815

00:58:03.410 --> 00:58:05.170 out their their sequence and

NOTE Confidence: 0.9733815

00:58:05.170 --> 00:58:06.130 get their three to five

NOTE Confidence: 0.9733815

00:58:06.130 --> 00:58:07.410 million variants. But when we

NOTE Confidence: 0.9733815

00:58:07.410 --> 00:58:08.369 go to round on them

NOTE Confidence: 0.9733815

00:58:08.369 --> 00:58:09.734 the next day, most of

NOTE Confidence: 0.9733815

00:58:09.734 --> 00:58:10.934 those list of variants will

NOTE Confidence: 0.9733815

00:58:10.934 --> 00:58:11.894 have no idea what they

NOTE Confidence: 0.9733815

00:58:11.894 --> 00:58:13.755 mean. And we really just

NOTE Confidence: 0.9733815

00:58:13.894 --> 00:58:15.015 skim the cream to be

NOTE Confidence: 0.9733815

00:58:15.015 --> 00:58:15.734 able to come up with

NOTE Confidence: 0.9733815

00:58:15.734 --> 00:58:16.714 any real diagnosis.

NOTE Confidence: 0.98817384

00:58:17.015 --> 00:58:18.055 But we're doing it pretty

NOTE Confidence: 0.98817384

00:58:18.055 --> 00:58:19.255 effectively so far. We'll get

NOTE Confidence: 0.98817384

00:58:19.255 --> 00:58:20.055 better at it, but we

NOTE Confidence: 0.98817384

00:58:20.055 --> 00:58:20.855 got a long way to

NOTE Confidence: 0.98817384

00:58:20.855 --> 00:58:22.234 go in this simple step.

NOTE Confidence: 0.998074

00:58:23.090 --> 00:58:25.170 That's the scientific challenge. We

NOTE Confidence: 0.998074

00:58:25.170 --> 00:58:27.270 also face societal challenges.

NOTE Confidence: 0.9953206

00:58:27.650 --> 00:58:29.190 Why are there societal challenges?

NOTE Confidence: 0.9953206

00:58:29.330 --> 00:58:31.330 Because genomics is now relevant

NOTE Confidence: 0.9953206

00:58:31.330 --> 00:58:31.990 in society.

NOTE Confidence: 0.96547854

00:58:32.450 --> 00:58:34.050 It wasn't always the case.

NOTE Confidence: 0.96547854

00:58:34.050 --> 00:58:35.490 I can tell you that

NOTE Confidence: 0.96547854

00:58:35.490 --> 00:58:37.110 when the Genome Project began

NOTE Confidence: 0.88875735

00:58:37.490 --> 00:58:39.105 and all the geekies people

NOTE Confidence: 0.88875735

00:58:39.105 --> 00:58:40.145 like me that were mapping

NOTE Confidence: 0.88875735

00:58:40.145 --> 00:58:40.945 and sequenced in the human

NOTE Confidence: 0.88875735

00:58:40.945 --> 00:58:42.165 genome, we would get together.

NOTE Confidence: 0.9911499

00:58:42.465 --> 00:58:44.225 We would feel like kids

NOTE Confidence: 0.9911499

00:58:44.225 --> 00:58:45.025 at a holiday,

NOTE Confidence: 0.95155525

00:58:45.345 --> 00:58:46.545 gathering of a family at

NOTE Confidence: 0.95155525

00:58:46.545 --> 00:58:48.065 the kids' table. Right? Kids'

NOTE Confidence: 0.95155525

00:58:48.065 --> 00:58:48.785 table, I don't know about

NOTE Confidence: 0.95155525

00:58:48.785 --> 00:58:49.665 your families, but we had

NOTE Confidence: 0.95155525

00:58:49.665 --> 00:58:50.920 kids' table. That's where all

NOTE Confidence: 0.95155525

00:58:50.920 --> 00:58:52.120 the fun was. But, you

NOTE Confidence: 0.95155525

00:58:52.120 --> 00:58:52.840 know, you didn't have any

NOTE Confidence: 0.95155525

00:58:52.840 --> 00:58:53.960 worries. Right? Because we were

NOTE Confidence: 0.95155525

00:58:53.960 --> 00:58:54.600 a bunch of kids. We

NOTE Confidence: 0.95155525

00:58:54.600 --> 00:58:55.080 were just a bunch of

NOTE Confidence: 0.95155525

00:58:55.080 --> 00:58:56.200 people mapping and sequencing. You

NOTE Confidence: 0.95155525

00:58:56.200 --> 00:58:57.560 know, people weren't paying attention.

NOTE Confidence: 0.95155525

00:58:57.560 --> 00:58:58.940 Society wasn't paying attention.

NOTE Confidence: 0.974709

00:58:59.240 --> 00:59:00.620 But we've made that transition

NOTE Confidence: 0.974709

00:59:00.680 --> 00:59:02.680 now because now, no, Eric.

NOTE Confidence: 0.974709

00:59:02.680 --> 00:59:03.640 You can't sit at the

NOTE Confidence: 0.974709

00:59:03.640 --> 00:59:04.825 kids' table. I don't care

NOTE Confidence: 0.974709

00:59:04.825 --> 00:59:06.205 that they're talking about iPhones,

NOTE Confidence: 0.974709

00:59:06.265 --> 00:59:07.945 Instagram, and Taylor Swift. You

NOTE Confidence: 0.974709

00:59:07.945 --> 00:59:09.145 have to stay here and

NOTE Confidence: 0.974709

00:59:09.145 --> 00:59:10.445 talk about mortgages,

NOTE Confidence: 0.993103

00:59:10.745 --> 00:59:12.845 life insurance, taxes, politics,

NOTE Confidence: 0.92993164

00:59:13.385 --> 00:59:14.905 and genomic medicine and health

NOTE Confidence: 0.92993164

00:59:14.905 --> 00:59:15.405 care.

NOTE Confidence: 0.99665177

00:59:15.785 --> 00:59:17.645 This is because we've touched

NOTE Confidence: 0.99665177

00:59:17.705 --> 00:59:18.445 health care.

NOTE Confidence: 0.966411

00:59:18.789 --> 00:59:20.250 What is a more complicated

NOTE Confidence: 0.966411

00:59:20.470 --> 00:59:22.009 issue on set of circumstances

NOTE Confidence: 0.966411

00:59:22.230 --> 00:59:23.269 than health care for any

NOTE Confidence: 0.966411

00:59:23.269 --> 00:59:24.549 society in any part of

NOTE Confidence: 0.966411

00:59:24.549 --> 00:59:25.829 the world? And as a

NOTE Confidence: 0.966411

00:59:25.829 --> 00:59:26.869 result, we now have adult

NOTE Confidence: 0.966411

00:59:26.869 --> 00:59:27.369 problems.

NOTE Confidence: 0.98217773

00:59:27.670 --> 00:59:28.650 Because now

NOTE Confidence: 0.98170036

00:59:28.950 --> 00:59:29.910 we have to face all

NOTE Confidence: 0.98170036

00:59:29.910 --> 00:59:31.829 the societal challenges associated with

NOTE Confidence: 0.98170036

00:59:31.829 --> 00:59:32.955 health care now just with

NOTE Confidence: 0.98170036

00:59:32.955 --> 00:59:34.315 a genomic lens. How does

NOTE Confidence: 0.98170036

00:59:34.315 --> 00:59:35.355 it get paid for? How

NOTE Confidence: 0.98170036

00:59:35.355 --> 00:59:36.715 does it get delivered? How

NOTE Confidence: 0.98170036

00:59:36.715 --> 00:59:38.155 exactly do we regulate it?

NOTE Confidence: 0.98170036

00:59:38.155 --> 00:59:39.515 How exactly do we ensure

NOTE Confidence: 0.98170036

00:59:39.515 --> 00:59:41.115 equity? How exactly do we

NOTE Confidence: 0.98170036

00:59:41.115 --> 00:59:42.795 ensure privacy? Oh, and by

NOTE Confidence: 0.98170036

00:59:42.795 --> 00:59:43.675 the way, we got a

NOTE Confidence: 0.98170036

00:59:43.675 --> 00:59:45.035 lot of literacy issues, both

NOTE Confidence: 0.98170036

00:59:45.035 --> 00:59:46.155 for patients and health care

NOTE Confidence: 0.98170036

00:59:46.155 --> 00:59:47.295 professionals alike.

NOTE Confidence: 0.97525895

00:59:48.090 --> 00:59:49.130 And so these are all

NOTE Confidence: 0.97525895

00:59:49.130 --> 00:59:50.250 things we are embracing as

NOTE Confidence: 0.97525895

00:59:50.250 --> 00:59:51.610 well. And we as a

NOTE Confidence: 0.97525895

00:59:51.610 --> 00:59:53.370 ecosystem of professionals, whether it's

NOTE Confidence: 0.97525895

00:59:53.370 --> 00:59:55.130 the private sector, whether it's

NOTE Confidence: 0.97525895

00:59:55.130 --> 00:59:57.130 government, whether it's academia, have

NOTE Confidence: 0.97525895

00:59:57.130 --> 00:59:58.250 to own up and help

NOTE Confidence: 0.97525895

00:59:58.250 --> 00:59:59.950 address all these societal issues,

NOTE Confidence: 0.97525895

01:00:00.090 --> 01:00:01.290 not to mention many, many

NOTE Confidence: 0.97525895

01:00:01.290 --> 01:00:02.330 other issues that I didn't

NOTE Confidence: 0.97525895

01:00:02.330 --> 01:00:03.255 even have time to talk

NOTE Confidence: 0.97525895

01:00:03.255 --> 01:00:03.755 about.

NOTE Confidence: 0.99816895

01:00:04.375 --> 01:00:05.815 So with that, let me

NOTE Confidence: 0.99816895

01:00:05.815 --> 01:00:07.335 just close by just saying

NOTE Confidence: 0.99816895

01:00:07.335 --> 01:00:08.694 that what I've told you

NOTE Confidence: 0.99816895

01:00:08.694 --> 01:00:09.194 about,

NOTE Confidence: 0.94575834

01:00:09.575 --> 01:00:10.855 through a walk down memory

NOTE Confidence: 0.94575834

01:00:10.855 --> 01:00:12.454 lane or a history lesson

NOTE Confidence: 0.94575834

01:00:12.454 --> 01:00:13.734 alike is how we went

NOTE Confidence: 0.94575834

01:00:13.734 --> 01:00:15.194 from the most basic information

NOTE Confidence: 0.94575834

01:00:15.255 --> 01:00:16.875 about DNA's structure.

NOTE Confidence: 0.9560547

01:00:17.255 --> 01:00:18.710 We put a magnifying glass

NOTE Confidence: 0.9560547

01:00:18.710 --> 01:00:19.750 on it during the Human

NOTE Confidence: 0.9560547

01:00:19.750 --> 01:00:20.569 Genome Project,

NOTE Confidence: 0.9619629

01:00:21.270 --> 01:00:22.550 read out the sequence, and

NOTE Confidence: 0.9619629

01:00:22.550 --> 01:00:24.250 then use threads of genomics

NOTE Confidence: 0.9980469

01:00:24.630 --> 01:00:25.450 to increasingly

NOTE Confidence: 0.9981399

01:00:26.069 --> 01:00:28.010 create a tapestry that affected

NOTE Confidence: 0.9981399

01:00:28.069 --> 01:00:28.970 basic science

NOTE Confidence: 0.84418947

01:00:29.270 --> 01:00:31.690 and affected translational science, increasingly

NOTE Confidence: 0.9846115

01:00:32.335 --> 01:00:34.095 clinical research. And now as

NOTE Confidence: 0.9846115

01:00:34.095 --> 01:00:35.855 we, including people here, are

NOTE Confidence: 0.9846115

01:00:35.855 --> 01:00:37.455 helping to continue to to

NOTE Confidence: 0.9846115

01:00:37.455 --> 01:00:39.295 put stitch together this growing

NOTE Confidence: 0.9846115

01:00:39.295 --> 01:00:41.215 tapestry of genomics being used

NOTE Confidence: 0.9846115

01:00:41.215 --> 01:00:42.895 in medicine. And so with

NOTE Confidence: 0.9846115

01:00:42.895 --> 01:00:44.175 that, I will stop, and

NOTE Confidence: 0.9846115

01:00:44.175 --> 01:00:45.215 I'm happy to take any

NOTE Confidence: 0.9846115

01:00:45.215 --> 01:00:46.275 questions. Thank you.

NOTE Confidence: 0.95081985

01:00:55.250 --> 01:00:56.369 Thank you, Eric. Sure. Does

NOTE Confidence: 0.95081985

01:00:56.369 --> 01:00:57.970 anyone have any questions? And

NOTE Confidence: 0.95081985

01:00:57.970 --> 01:00:59.410 I realized my excitement, I

NOTE Confidence: 0.95081985

01:00:59.410 --> 01:01:00.450 went a little longer than

NOTE Confidence: 0.95081985

01:01:00.450 --> 01:01:01.234 I thought. So people have

NOTE Confidence: 0.95081985

01:01:01.234 --> 01:01:01.994 to go off to do

NOTE Confidence: 0.95081985

01:01:01.994 --> 01:01:03.035 important things, that's fine. But

NOTE Confidence: 0.95081985

01:01:03.035 --> 01:01:03.915 I'm also happy to stay

NOTE Confidence: 0.95081985

01:01:03.915 --> 01:01:04.734 here for questions.

NOTE Confidence: 0.8761161

01:01:06.315 --> 01:01:07.595 Over here? That's yeah. The

NOTE Confidence: 0.8761161

01:01:07.595 --> 01:01:08.494 back. Yeah.

NOTE Confidence: 0.6709884

01:01:09.035 --> 01:01:10.555 Look. With all this golden

NOTE Confidence: 0.6709884

01:01:10.555 --> 01:01:11.994 element data Yeah. You know,

NOTE Confidence: 0.6709884

01:01:11.994 --> 01:01:13.915 potentially, are soon being available

NOTE Confidence: 0.6709884

01:01:13.915 --> 01:01:14.895 up to the patients,

NOTE Confidence: 0.4633789

01:01:15.275 --> 01:01:15.775 and

NOTE Confidence: 0.8277588

01:01:16.510 --> 01:01:17.250 the interpretability

NOTE Confidence: 0.8421705

01:01:17.630 --> 01:01:20.030 being hard, requiring complicated things

NOTE Confidence: 0.8421705

01:01:20.030 --> 01:01:21.230 happening in the cloud or,

NOTE Confidence: 0.8421705

01:01:21.230 --> 01:01:22.430 like, you know, reference need

NOTE Confidence: 0.8421705

01:01:22.430 --> 01:01:23.790 to Yeah. Databases and that

NOTE Confidence: 0.8421705

01:01:23.790 --> 01:01:24.990 all being boiled down into

NOTE Confidence: 0.8421705

01:01:24.990 --> 01:01:26.670 a report. It's available to

NOTE Confidence: 0.8421705

01:01:26.670 --> 01:01:27.890 the clinician directly.

NOTE Confidence: 0.7685547

01:01:28.190 --> 01:01:30.050 It is often interpreted

NOTE Confidence: 0.9073181

01:01:30.695 --> 01:01:32.055 as a sort of output

NOTE Confidence: 0.9073181

01:01:32.055 --> 01:01:33.035 of black box.

NOTE Confidence: 0.9942763

01:01:34.135 --> 01:01:35.095 Where do you see the

NOTE Confidence: 0.9942763

01:01:35.095 --> 01:01:37.195 role of individual pathologists

NOTE Confidence: 0.91306967

01:01:37.975 --> 01:01:39.415 in this process? You know,

NOTE Confidence: 0.91306967

01:01:39.415 --> 01:01:40.695 how do they factor into

NOTE Confidence: 0.91306967

01:01:40.695 --> 01:01:42.660 that model of patient care?

NOTE Confidence: 0.96735364

01:01:43.140 --> 01:01:44.099 Yeah. I you know, you

NOTE Confidence: 0.96735364

01:01:44.099 --> 01:01:45.059 gotta get to the table.

NOTE Confidence: 0.96735364

01:01:45.059 --> 01:01:45.940 Right? I mean, there's just

NOTE Confidence: 0.96735364

01:01:45.940 --> 01:01:47.460 an expression that I've often

NOTE Confidence: 0.96735364

01:01:47.460 --> 01:01:48.099 heard, you know, if you're

NOTE Confidence: 0.96735364

01:01:48.099 --> 01:01:48.819 not on the table, you're

NOTE Confidence: 0.96735364

01:01:48.819 --> 01:01:49.780 at the you're, you know,

NOTE Confidence: 0.96735364

01:01:49.780 --> 01:01:50.500 you're not at the table,

NOTE Confidence: 0.96735364

01:01:50.500 --> 01:01:51.400 you're on the menu.

NOTE Confidence: 0.9551063

01:01:52.260 --> 01:01:53.380 And, you know, so I

NOTE Confidence: 0.9551063

01:01:53.380 --> 01:01:54.420 mean, there's a lot I

NOTE Confidence: 0.9551063

01:01:54.420 --> 01:01:55.539 mean, I I would love

NOTE Confidence: 0.9551063

01:01:55.539 --> 01:01:57.505 to see more pathologists involved

NOTE Confidence: 0.9551063

01:01:57.505 --> 01:01:58.465 in a lot of these

NOTE Confidence: 0.9551063

01:01:58.465 --> 01:01:58.865 these,

NOTE Confidence: 0.9791504

01:01:59.345 --> 01:02:00.385 working groups and a lot

NOTE Confidence: 0.9791504

01:02:00.385 --> 01:02:01.825 of these public private partnerships,

NOTE Confidence: 0.9791504

01:02:01.825 --> 01:02:02.885 a lot of these consortium

NOTE Confidence: 0.9660269

01:02:03.185 --> 01:02:04.945 because they're they they know

NOTE Confidence: 0.9660269

01:02:04.945 --> 01:02:05.825 what this is like to

NOTE Confidence: 0.9660269

01:02:05.825 --> 01:02:07.605 deliver diagnostic information.

NOTE Confidence: 0.9072876

01:02:07.985 --> 01:02:09.265 And I think the there's

NOTE Confidence: 0.9072876

01:02:09.345 --> 01:02:10.145 would be a new world

NOTE Confidence: 0.9072876

01:02:10.145 --> 01:02:12.110 here, and, we need that

NOTE Confidence: 0.9072876

01:02:12.110 --> 01:02:12.350 expertise,

NOTE Confidence: 0.963501

01:02:13.390 --> 01:02:14.590 at at in in all

NOTE Confidence: 0.963501

01:02:14.590 --> 01:02:15.490 of these arenas.

NOTE Confidence: 0.894832

01:02:17.790 --> 01:02:19.870 Yeah. What's, when you choose

NOTE Confidence: 0.894832

01:02:19.870 --> 01:02:21.310 the image of human, which

NOTE Confidence: 0.894832

01:02:21.310 --> 01:02:22.750 human? And in the research,

NOTE Confidence: 0.894832

01:02:22.750 --> 01:02:24.445 you know, which we which

NOTE Confidence: 0.894832

01:02:24.605 --> 01:02:25.325 Yeah. So I didn't cut

NOTE Confidence: 0.894832

01:02:25.405 --> 01:02:26.285 so it's a great question.

NOTE Confidence: 0.894832

01:02:26.285 --> 01:02:27.724 I mean, let's let's the

NOTE Confidence: 0.894832

01:02:27.724 --> 01:02:28.525 the I won't tell you

NOTE Confidence: 0.894832

01:02:28.525 --> 01:02:29.724 the story about so the

NOTE Confidence: 0.894832

01:02:29.724 --> 01:02:30.525 first thing is the Human

NOTE Confidence: 0.894832

01:02:30.525 --> 01:02:32.545 Genome Project produced a tapestry.

NOTE Confidence: 0.9563802

01:02:32.925 --> 01:02:33.885 It was it was it

NOTE Confidence: 0.9563802

01:02:33.885 --> 01:02:35.105 was a bunch of people.

NOTE Confidence: 0.9563802

01:02:35.244 --> 01:02:36.445 It was mostly one of,

NOTE Confidence: 0.9563802

01:02:36.445 --> 01:02:37.565 like, little almost half was

NOTE Confidence: 0.9563802

01:02:37.565 --> 01:02:39.120 one person for complicated reasons,

NOTE Confidence: 0.9563802

01:02:39.200 --> 01:02:40.000 but but it was a

NOTE Confidence: 0.9563802

01:02:40.000 --> 01:02:41.200 tapestry. And it that doesn't

NOTE Confidence: 0.9563802

01:02:41.200 --> 01:02:42.800 matter because, you know, since

NOTE Confidence: 0.9563802

01:02:42.800 --> 01:02:44.000 we're ninety nine point, you

NOTE Confidence: 0.9563802

01:02:44.000 --> 01:02:45.120 know, six percent the same

NOTE Confidence: 0.9563802

01:02:45.120 --> 01:02:46.240 and ninety point four percent

NOTE Confidence: 0.9563802

01:02:46.240 --> 01:02:46.820 the same,

NOTE Confidence: 0.97566223

01:02:47.360 --> 01:02:48.960 that first reference genome doesn't

NOTE Confidence: 0.97566223

01:02:48.960 --> 01:02:49.920 matter. But what you're and

NOTE Confidence: 0.97566223

01:02:49.920 --> 01:02:51.220 I didn't talk about this.

NOTE Confidence: 0.97566223

01:02:51.280 --> 01:02:51.705 But,

NOTE Confidence: 0.9157302

01:02:52.105 --> 01:02:53.225 you know, right now people

NOTE Confidence: 0.9157302

01:02:53.225 --> 01:02:54.425 are operating over with a

NOTE Confidence: 0.9157302

01:02:54.425 --> 01:02:55.865 few reference genomes. These are

NOTE Confidence: 0.9157302

01:02:55.865 --> 01:02:57.625 very high quality. But increasingly,

NOTE Confidence: 0.9157302

01:02:57.625 --> 01:02:58.745 you're gonna hear the phrase,

NOTE Confidence: 0.9157302

01:02:58.745 --> 01:02:59.245 Pangenome.

NOTE Confidence: 0.95960355

01:02:59.865 --> 01:03:01.225 Because in fact, one of

NOTE Confidence: 0.95960355

01:03:01.225 --> 01:03:02.425 the challenges that we have,

NOTE Confidence: 0.95960355

01:03:02.425 --> 01:03:03.465 and it plays right into

NOTE Confidence: 0.95960355

01:03:03.465 --> 01:03:05.065 the equity argument, is that

NOTE Confidence: 0.95960355

01:03:05.065 --> 01:03:06.425 if we sequence Dave and

NOTE Confidence: 0.95960355

01:03:06.425 --> 01:03:08.109 my genomes, there's one set

NOTE Confidence: 0.95960355

01:03:08.109 --> 01:03:09.310 of references that'd be really

NOTE Confidence: 0.95960355

01:03:09.310 --> 01:03:10.990 good. But if we sequence

NOTE Confidence: 0.95960355

01:03:10.990 --> 01:03:13.470 somebody from, you know, from

NOTE Confidence: 0.95960355

01:03:13.470 --> 01:03:14.990 Africa or somebody from South

NOTE Confidence: 0.95960355

01:03:14.990 --> 01:03:15.950 America, if we use those

NOTE Confidence: 0.95960355

01:03:15.950 --> 01:03:17.230 same references, we're gonna miss

NOTE Confidence: 0.95960355

01:03:17.230 --> 01:03:18.670 things. So that causes a

NOTE Confidence: 0.95960355

01:03:18.670 --> 01:03:20.210 discrepancy or a disparity.

NOTE Confidence: 0.83114284

01:03:20.590 --> 01:03:21.790 So what's happening, so we've

NOTE Confidence: 0.83114284

01:03:21.790 --> 01:03:22.830 signed called the Human Pan

NOTE Confidence: 0.83114284

01:03:22.830 --> 01:03:24.085 Genome Program, which is heavily

NOTE Confidence: 0.83114284

01:03:24.085 --> 01:03:25.145 supported by NHGRI,

NOTE Confidence: 0.970431

01:03:25.525 --> 01:03:27.205 is hundreds and hundreds of

NOTE Confidence: 0.970431

01:03:27.205 --> 01:03:28.885 high quality references are being

NOTE Confidence: 0.970431

01:03:28.885 --> 01:03:30.965 generated, and ultimately are being

NOTE Confidence: 0.970431

01:03:30.965 --> 01:03:31.465 amalgamated

NOTE Confidence: 0.9343669

01:03:31.765 --> 01:03:33.445 in a computational way. So

NOTE Confidence: 0.9343669

01:03:33.445 --> 01:03:34.405 that there will be like

NOTE Confidence: 0.9343669

01:03:34.405 --> 01:03:35.145 a universal,

NOTE Confidence: 0.9916992

01:03:35.910 --> 01:03:36.650 highly heterogeneous

NOTE Confidence: 0.97038156

01:03:36.950 --> 01:03:38.309 set of reference genomes that'll

NOTE Confidence: 0.97038156

01:03:38.309 --> 01:03:39.750 be properly matched to any

NOTE Confidence: 0.97038156

01:03:39.750 --> 01:03:41.349 patient's genome. And it's gonna

NOTE Confidence: 0.97038156

01:03:41.349 --> 01:03:42.390 be critical it it's a

NOTE Confidence: 0.97038156

01:03:42.390 --> 01:03:44.410 it's a really important concept

NOTE Confidence: 0.97038156

01:03:44.549 --> 01:03:45.349 that I just gave very

NOTE Confidence: 0.97038156

01:03:45.349 --> 01:03:46.710 short trip to. But we

NOTE Confidence: 0.97038156

01:03:46.710 --> 01:03:48.309 have to have properly matched

NOTE Confidence: 0.97038156

01:03:48.309 --> 01:03:48.809 reference

NOTE Confidence: 1

01:03:49.190 --> 01:03:49.690 genomes

NOTE Confidence: 0.97687787

01:03:50.045 --> 01:03:51.725 to implement genomics across all

NOTE Confidence: 0.97687787

01:03:51.725 --> 01:03:53.485 human populations. Those are being

NOTE Confidence: 0.97687787

01:03:53.485 --> 01:03:54.625 generated. Yeah.

NOTE Confidence: 0.8691876

01:03:55.085 --> 01:03:56.205 So, you know, we all

NOTE Confidence: 0.8691876

01:03:56.205 --> 01:03:57.485 know that most kids in

NOTE Confidence: 0.8691876

01:03:57.485 --> 01:03:58.385 life are really,

NOTE Confidence: 0.7766147

01:03:59.005 --> 01:04:00.525 nature plus virtue. Right? Yes.

NOTE Confidence: 0.7766147

01:04:00.525 --> 01:04:02.125 So so is so question

NOTE Confidence: 0.7766147

01:04:02.125 --> 01:04:03.005 is, how are we going

NOTE Confidence: 0.7766147

01:04:03.005 --> 01:04:03.885 to get it where we

NOTE Confidence: 0.7766147

01:04:03.885 --> 01:04:04.990 see, hey. I have this

NOTE Confidence: 0.7766147

01:04:04.990 --> 01:04:06.670 variant. That's associated with this

NOTE Confidence: 0.7766147

01:04:06.670 --> 01:04:08.270 particular study. Everything will be

NOTE Confidence: 0.7766147

01:04:08.270 --> 01:04:08.770 Icelandic,

NOTE Confidence: 0.83415705

01:04:09.310 --> 01:04:10.510 a GWAS studies, which are

NOTE Confidence: 0.83415705

01:04:10.510 --> 01:04:12.190 fabulous. If you're Icelandic and

NOTE Confidence: 0.83415705

01:04:12.190 --> 01:04:13.710 live in Iceland. Yep. Right?

NOTE Confidence: 0.83415705

01:04:13.710 --> 01:04:14.750 And so how are we

NOTE Confidence: 0.83415705

01:04:14.750 --> 01:04:15.710 gonna get to the point

NOTE Confidence: 0.83415705

01:04:15.710 --> 01:04:16.670 where we see, well, this

NOTE Confidence: 0.83415705

01:04:16.670 --> 01:04:17.710 generated to be right under

NOTE Confidence: 0.83415705

01:04:17.710 --> 01:04:19.515 these conditions with these other

NOTE Confidence: 0.83415705

01:04:19.515 --> 01:04:20.015 background

NOTE Confidence: 0.865153

01:04:20.954 --> 01:04:22.075 genes, that was the issue

NOTE Confidence: 0.865153

01:04:22.075 --> 01:04:22.795 with this. But we don't

NOTE Confidence: 0.865153

01:04:22.795 --> 01:04:24.234 really have any idea whether

NOTE Confidence: 0.865153

01:04:24.234 --> 01:04:25.355 that variant has anything to

NOTE Confidence: 0.865153

01:04:25.355 --> 01:04:26.474 do with this other person

NOTE Confidence: 0.865153

01:04:26.474 --> 01:04:27.855 who's living in different conditions

NOTE Confidence: 0.78138316

01:04:28.315 --> 01:04:29.674 with whatever other things. So

NOTE Confidence: 0.78138316

01:04:29.674 --> 01:04:30.635 how do you know So

NOTE Confidence: 0.78138316

01:04:30.635 --> 01:04:31.080 fair.

NOTE Confidence: 0.9606151

01:04:31.480 --> 01:04:32.600 Because that makes they just

NOTE Confidence: 0.9606151

01:04:32.600 --> 01:04:34.680 like Particularly for common genetic

NOTE Confidence: 0.9606151

01:04:34.680 --> 01:04:35.960 disease for common diseases that

NOTE Confidence: 0.9606151

01:04:35.960 --> 01:04:37.320 have genetic so there's a

NOTE Confidence: 0.9606151

01:04:37.320 --> 01:04:38.280 few answers I can give

NOTE Confidence: 0.9606151

01:04:38.280 --> 01:04:39.340 to it. First of all,

NOTE Confidence: 0.9606151

01:04:39.400 --> 01:04:40.920 you know, I'll stress technology,

NOTE Confidence: 0.9606151

01:04:40.920 --> 01:04:42.200 technology, technology. If we can

NOTE Confidence: 0.9606151

01:04:42.280 --> 01:04:43.660 we just the more technologies

NOTE Confidence: 0.9606151

01:04:43.720 --> 01:04:44.680 we could bring to bear

NOTE Confidence: 0.9606151

01:04:44.680 --> 01:04:45.924 on this to either have

NOTE Confidence: 0.9606151

01:04:45.924 --> 01:04:47.285 ways of measuring our physical

NOTE Confidence: 0.9606151

01:04:47.285 --> 01:04:48.724 and social environment or to

NOTE Confidence: 0.9606151

01:04:48.724 --> 01:04:50.085 have markers of our physical

NOTE Confidence: 0.9606151

01:04:50.085 --> 01:04:51.125 and social environment, which is

NOTE Confidence: 0.9606151

01:04:51.125 --> 01:04:52.885 where epigenomics can come in.

NOTE Confidence: 0.9606151

01:04:52.885 --> 01:04:54.484 And so epigenomics sort of

NOTE Confidence: 0.9606151

01:04:54.484 --> 01:04:56.025 gets clumped in with genomics,

NOTE Confidence: 0.9606151

01:04:56.244 --> 01:04:58.244 but indeed, epigenomics is oftentimes

NOTE Confidence: 0.9606151

01:04:58.244 --> 01:04:59.605 a reflection of our environment

NOTE Confidence: 0.9606151

01:04:59.605 --> 01:05:00.640 if we can learn. So

NOTE Confidence: 0.9606151

01:05:00.640 --> 01:05:02.420 that's one way, technology innovation.

NOTE Confidence: 0.9606151

01:05:02.640 --> 01:05:03.600 The other way, this is

NOTE Confidence: 0.9606151

01:05:03.600 --> 01:05:05.040 why we have these very

NOTE Confidence: 0.9606151

01:05:05.040 --> 01:05:07.460 large population scale cohort studies.

NOTE Confidence: 0.9606151

01:05:07.600 --> 01:05:08.400 The biggest one in the

NOTE Confidence: 0.9606151

01:05:08.400 --> 01:05:09.359 United States is the all

NOTE Confidence: 0.9606151

01:05:09.359 --> 01:05:10.720 of us research program in

NOTE Confidence: 0.9606151

01:05:10.720 --> 01:05:12.400 the UK. The leading cohort

NOTE Confidence: 0.9606151

01:05:12.400 --> 01:05:14.560 study worldwide is is, is

NOTE Confidence: 0.9606151

01:05:14.560 --> 01:05:16.125 the UK Biobank where they

NOTE Confidence: 0.9606151

01:05:16.125 --> 01:05:18.365 have collected massive amounts of,

NOTE Confidence: 0.9606151

01:05:18.365 --> 01:05:19.885 of data from individuals where

NOTE Confidence: 0.9606151

01:05:19.885 --> 01:05:22.045 they've included social, physical environment,

NOTE Confidence: 0.9606151

01:05:22.045 --> 01:05:23.805 genomic data, epigenomic data, etcetera,

NOTE Confidence: 0.9606151

01:05:23.805 --> 01:05:25.565 etcetera, and start to develop

NOTE Confidence: 0.9606151

01:05:25.565 --> 01:05:27.005 correlations. It becomes a data

NOTE Confidence: 0.9606151

01:05:27.005 --> 01:05:29.085 analysis challenge, but that's the

NOTE Confidence: 0.9606151

01:05:29.085 --> 01:05:29.885 other way to do it.

NOTE Confidence: 0.9606151

01:05:29.885 --> 01:05:30.385 So

NOTE Confidence: 0.9584517

01:05:30.830 --> 01:05:31.630 sort of on those are

NOTE Confidence: 0.9584517

01:05:31.790 --> 01:05:33.150 but but we should never

NOTE Confidence: 0.9584517

01:05:33.150 --> 01:05:33.650 underestimate

NOTE Confidence: 0.9995117

01:05:34.030 --> 01:05:34.690 the complexity

NOTE Confidence: 0.99609375

01:05:35.470 --> 01:05:37.010 of physiology or pathophysiology.

NOTE Confidence: 0.8430786

01:05:37.870 --> 01:05:39.230 But, honestly, that's a concern

NOTE Confidence: 0.8430786

01:05:39.230 --> 01:05:40.990 for doing the the gen

NOTE Confidence: 0.8430786

01:05:40.990 --> 01:05:42.830 sequencing team. New words, they're

NOTE Confidence: 0.8430786

01:05:42.830 --> 01:05:44.190 just finding awful lot of

NOTE Confidence: 0.8430786

01:05:44.190 --> 01:05:45.295 stuff where people are just

NOTE Confidence: 0.8430786

01:05:45.295 --> 01:05:46.415 gonna get freaked out by

NOTE Confidence: 0.8430786

01:05:46.415 --> 01:05:47.495 stuff, which is Which why

NOTE Confidence: 0.8430786

01:05:47.615 --> 01:05:48.975 and and we probably and

NOTE Confidence: 0.8430786

01:05:48.975 --> 01:05:49.695 which is why that we

NOTE Confidence: 0.8430786

01:05:49.695 --> 01:05:51.135 don't want that tsunami of

NOTE Confidence: 0.8430786

01:05:51.135 --> 01:05:53.155 fear to come in. However,

NOTE Confidence: 0.9338542

01:05:53.535 --> 01:05:55.135 knowing which rare diseases they

NOTE Confidence: 0.9338542

01:05:55.135 --> 01:05:56.435 may have, knowing their pharmacogenomic

NOTE Confidence: 0.988737

01:05:56.815 --> 01:05:58.435 profile, knowing their cancer predisposition,

NOTE Confidence: 0.9850377

01:05:59.060 --> 01:05:59.940 We that's what we need

NOTE Confidence: 0.9850377

01:05:59.940 --> 01:06:00.600 to study.

NOTE Confidence: 0.9720618

01:06:01.140 --> 01:06:02.100 And we also need to

NOTE Confidence: 0.9720618

01:06:02.100 --> 01:06:03.619 decide nobody first of all,

NOTE Confidence: 0.9720618

01:06:03.619 --> 01:06:04.340 nobody should have to have

NOTE Confidence: 0.9720618

01:06:04.340 --> 01:06:05.140 that done if they don't

NOTE Confidence: 0.9720618

01:06:05.140 --> 01:06:06.340 want, and then nobody should

NOTE Confidence: 0.9720618

01:06:06.340 --> 01:06:07.300 have to get information they

NOTE Confidence: 0.9720618

01:06:07.300 --> 01:06:08.500 don't want. And I think

NOTE Confidence: 0.9720618

01:06:08.500 --> 01:06:09.700 you'll have a like everything

NOTE Confidence: 0.9720618

01:06:09.700 --> 01:06:10.820 else in life, people have

NOTE Confidence: 0.9720618

01:06:10.820 --> 01:06:11.175 big

NOTE Confidence: 0.9455664

01:06:11.815 --> 01:06:12.855 a a range of ideas

NOTE Confidence: 0.9455664

01:06:12.855 --> 01:06:13.815 of what they wanna know

NOTE Confidence: 0.9455664

01:06:13.815 --> 01:06:14.695 and when they wanna know

NOTE Confidence: 0.9455664

01:06:14.695 --> 01:06:15.815 it. And there'll be lots

NOTE Confidence: 0.9455664

01:06:15.815 --> 01:06:16.935 of questions about it. What

NOTE Confidence: 0.9455664

01:06:16.935 --> 01:06:18.855 age should people learn about

NOTE Confidence: 0.9455664

01:06:18.855 --> 01:06:19.735 this? I think once they're

NOTE Confidence: 0.9455664

01:06:19.735 --> 01:06:20.615 adults, they should make their

NOTE Confidence: 0.9455664

01:06:20.615 --> 01:06:21.895 own decisions, and parents will

NOTE Confidence: 0.9455664

01:06:21.895 --> 01:06:23.435 decide for kids until then.

NOTE Confidence: 0.77103096

01:06:24.230 --> 01:06:26.230 Yes. One more last question

NOTE Confidence: 0.77103096

01:06:26.230 --> 01:06:26.890 since I'm

NOTE Confidence: 0.9038086

01:06:27.190 --> 01:06:27.690 moderator.

NOTE Confidence: 0.90919375

01:06:27.990 --> 01:06:29.990 Yeah. Sure. Yesterday, Craig Venter

NOTE Confidence: 0.90919375

01:06:29.990 --> 01:06:31.190 died. Yes. But you didn't

NOTE Confidence: 0.90919375

01:06:31.190 --> 01:06:32.390 mention that name in the

NOTE Confidence: 0.90919375

01:06:32.390 --> 01:06:33.670 old history story. How do

NOTE Confidence: 0.90919375

01:06:33.670 --> 01:06:35.109 you fit that in? So

NOTE Confidence: 0.90919375

01:06:35.109 --> 01:06:35.609 so,

NOTE Confidence: 0.7862854

01:06:36.204 --> 01:06:37.405 so, boy, so Craig,

NOTE Confidence: 0.8592665

01:06:37.964 --> 01:06:39.085 for those who don't, the

NOTE Confidence: 0.8592665

01:06:39.085 --> 01:06:40.525 young people here barely maybe

NOTE Confidence: 0.8592665

01:06:40.525 --> 01:06:41.724 you didn't even appreciate who

NOTE Confidence: 0.8592665

01:06:41.724 --> 01:06:42.525 Craig Van Nuys.

NOTE Confidence: 0.86048585

01:06:42.924 --> 01:06:44.765 Craig was a brilliant scientist,

NOTE Confidence: 0.86048585

01:06:44.765 --> 01:06:45.645 at first I would say,

NOTE Confidence: 0.86048585

01:06:45.645 --> 01:06:46.684 and I'm very sorry that

NOTE Confidence: 0.86048585

01:06:46.684 --> 01:06:48.720 he passed away. Brilliant scientist,

NOTE Confidence: 0.97932947

01:06:49.260 --> 01:06:50.400 incredible innovator,

NOTE Confidence: 0.9400716

01:06:52.060 --> 01:06:53.040 a bit of a renegade.

NOTE Confidence: 0.95769393

01:06:53.740 --> 01:06:55.260 And what Craig did was

NOTE Confidence: 0.95769393

01:06:55.260 --> 01:06:56.220 he was actually part of

NOTE Confidence: 0.95769393

01:06:56.220 --> 01:06:58.060 the Human Genome Project, but

NOTE Confidence: 0.95769393

01:06:58.060 --> 01:06:59.260 he got he he got

NOTE Confidence: 0.95769393

01:06:59.260 --> 01:07:00.460 a little on but he

NOTE Confidence: 0.95769393

01:07:00.460 --> 01:07:01.520 was also somebody

NOTE Confidence: 0.97333527

01:07:01.825 --> 01:07:03.105 where he before he got

NOTE Confidence: 0.97333527

01:07:03.105 --> 01:07:04.065 involved in the Human Genome

NOTE Confidence: 0.97333527

01:07:04.065 --> 01:07:05.265 Project, he was the one

NOTE Confidence: 0.97333527

01:07:05.265 --> 01:07:07.445 that invented this idea of

NOTE Confidence: 0.97333527

01:07:07.505 --> 01:07:08.945 take a cDNA clone, get

NOTE Confidence: 0.97333527

01:07:08.945 --> 01:07:10.225 a little bit of of

NOTE Confidence: 0.97333527

01:07:10.225 --> 01:07:11.905 cDNA sequence from it, and

NOTE Confidence: 0.97333527

01:07:11.905 --> 01:07:13.505 immediately try to patent it.

NOTE Confidence: 0.97333527

01:07:13.505 --> 01:07:14.465 And so he he's always

NOTE Confidence: 0.97333527

01:07:14.465 --> 01:07:15.365 been an entrepreneur,

NOTE Confidence: 0.9450914

01:07:15.789 --> 01:07:17.390 and it eventually resulted in

NOTE Confidence: 0.9450914

01:07:17.390 --> 01:07:18.589 the Supreme Court striking down

NOTE Confidence: 0.9450914

01:07:18.589 --> 01:07:19.230 the idea that we should

NOTE Confidence: 0.9450914

01:07:19.230 --> 01:07:20.450 be able to patent genes.

NOTE Confidence: 0.9450914

01:07:20.589 --> 01:07:21.789 And so he's always wanting

NOTE Confidence: 0.9450914

01:07:21.789 --> 01:07:22.829 to move faster and do

NOTE Confidence: 0.9450914

01:07:22.829 --> 01:07:23.789 things in the best way.

NOTE Confidence: 0.9450914

01:07:23.789 --> 01:07:25.150 So he began participating in

NOTE Confidence: 0.9450914

01:07:25.150 --> 01:07:26.670 the Human Genome Project. And

NOTE Confidence: 0.9450914

01:07:26.670 --> 01:07:27.869 then at a pivotal point

NOTE Confidence: 0.9450914

01:07:27.869 --> 01:07:28.990 in the Genome Project, he

NOTE Confidence: 0.9450914

01:07:28.990 --> 01:07:30.369 said, you're going too slow.

NOTE Confidence: 0.9450914

01:07:30.515 --> 01:07:31.315 And so he joined a

NOTE Confidence: 0.9450914

01:07:31.315 --> 01:07:32.115 comp or he created a

NOTE Confidence: 0.9450914

01:07:32.115 --> 01:07:33.715 company called Celera Genomics to

NOTE Confidence: 0.9450914

01:07:33.715 --> 01:07:35.555 compete with the Human Genome

NOTE Confidence: 0.9450914

01:07:35.555 --> 01:07:37.395 Project and sell access to

NOTE Confidence: 0.9450914

01:07:37.395 --> 01:07:39.495 the genomic data for subscription,

NOTE Confidence: 0.95090413

01:07:40.035 --> 01:07:41.475 and also started to patent

NOTE Confidence: 0.95090413

01:07:41.475 --> 01:07:43.010 genes as well. And and

NOTE Confidence: 0.95090413

01:07:43.010 --> 01:07:44.210 so the Human Genome Project

NOTE Confidence: 0.95090413

01:07:44.210 --> 01:07:45.250 was releasing its data for

NOTE Confidence: 0.95090413

01:07:45.250 --> 01:07:46.369 free, and Craig was selling

NOTE Confidence: 0.95090413

01:07:46.369 --> 01:07:47.570 a subscription to access his

NOTE Confidence: 0.95090413

01:07:47.570 --> 01:07:48.070 DNA.

NOTE Confidence: 0.99641925

01:07:48.450 --> 01:07:49.750 That led to,

NOTE Confidence: 0.9996745

01:07:50.210 --> 01:07:51.430 an awkward situation

NOTE Confidence: 0.8883754

01:07:51.970 --> 01:07:53.250 of the, you know, the

NOTE Confidence: 0.8883754

01:07:53.250 --> 01:07:55.089 government funded and worldwide funded

NOTE Confidence: 0.8883754

01:07:55.089 --> 01:07:56.369 effort competing with the private

NOTE Confidence: 0.8883754

01:07:56.369 --> 01:07:57.765 sector that for the and

NOTE Confidence: 0.8883754

01:07:57.765 --> 01:07:58.645 it's a whole other lecture

NOTE Confidence: 0.8883754

01:07:58.645 --> 01:07:59.285 I could give, and I

NOTE Confidence: 0.8883754

01:07:59.285 --> 01:08:00.665 do give to classes sometimes,

NOTE Confidence: 0.9514645

01:08:01.045 --> 01:08:02.724 that led to President Clinton

NOTE Confidence: 0.9514645

01:08:02.724 --> 01:08:04.244 getting involved and Tony Blair

NOTE Confidence: 0.9514645

01:08:04.244 --> 01:08:06.405 getting involved to create a

NOTE Confidence: 0.9514645

01:08:06.405 --> 01:08:07.925 circumstance where we declared it

NOTE Confidence: 0.9514645

01:08:07.925 --> 01:08:09.285 a tie at the draft

NOTE Confidence: 0.9514645

01:08:09.285 --> 01:08:10.800 sequence where they said, okay,

NOTE Confidence: 0.9514645

01:08:11.040 --> 01:08:12.000 Nope. Every it's a tie.

NOTE Confidence: 0.9514645

01:08:12.000 --> 01:08:13.680 Everybody and everybody wins. And

NOTE Confidence: 0.9514645

01:08:13.680 --> 01:08:14.880 there was an agreement that

NOTE Confidence: 0.9514645

01:08:14.880 --> 01:08:15.600 they would have a White

NOTE Confidence: 0.9514645

01:08:15.600 --> 01:08:17.280 House ceremony with with with,

NOTE Confidence: 0.9514645

01:08:17.680 --> 01:08:19.860 Bill Clinton and Francis Collins

NOTE Confidence: 0.9514645

01:08:20.080 --> 01:08:21.439 and Craig Venter and Tony

NOTE Confidence: 0.9514645

01:08:21.439 --> 01:08:22.560 Blair on a on a

NOTE Confidence: 0.9514645

01:08:22.560 --> 01:08:23.920 monitor coming in from the

NOTE Confidence: 0.9514645

01:08:23.920 --> 01:08:25.344 UK. They declared a tie.

NOTE Confidence: 0.9514645

01:08:25.344 --> 01:08:26.625 They then published their draft

NOTE Confidence: 0.9514645

01:08:26.625 --> 01:08:28.064 sequences in Science and Nature

NOTE Confidence: 0.9514645

01:08:28.064 --> 01:08:29.665 about four months later. And

NOTE Confidence: 0.9514645

01:08:29.665 --> 01:08:32.224 then Solera didn't survive. Why?

NOTE Confidence: 0.9514645

01:08:32.224 --> 01:08:33.344 Because who would wanna pay

NOTE Confidence: 0.9514645

01:08:33.344 --> 01:08:34.145 for something that you were

NOTE Confidence: 0.9514645

01:08:34.145 --> 01:08:35.104 gonna get for free? And

NOTE Confidence: 0.9514645

01:08:35.104 --> 01:08:36.465 the Genome Project produced free.

NOTE Confidence: 0.9514645

01:08:36.465 --> 01:08:37.425 So Craig went on and

NOTE Confidence: 0.9514645

01:08:37.425 --> 01:08:38.705 did some other incredible and

NOTE Confidence: 0.9514645

01:08:38.705 --> 01:08:40.570 productive things, but there was

NOTE Confidence: 0.9514645

01:08:40.570 --> 01:08:42.090 the race, and he he

NOTE Confidence: 0.9514645

01:08:42.090 --> 01:08:42.969 made the by the way,

NOTE Confidence: 0.9514645

01:08:42.969 --> 01:08:43.850 I'd I'd also give him

NOTE Confidence: 0.9514645

01:08:43.850 --> 01:08:45.050 credit. If it wasn't for

NOTE Confidence: 0.9514645

01:08:45.050 --> 01:08:46.910 him giving that that competitive,

NOTE Confidence: 0.9514645

01:08:47.130 --> 01:08:48.489 really awkward, and at times

NOTE Confidence: 0.9514645

01:08:48.489 --> 01:08:50.489 terrifying nudge, because he wanted

NOTE Confidence: 0.9514645

01:08:50.489 --> 01:08:51.530 the Genome Project to shut

NOTE Confidence: 0.9514645

01:08:51.530 --> 01:08:52.250 down and let him do

NOTE Confidence: 0.9514645

01:08:52.250 --> 01:08:53.130 it because then he'd make

NOTE Confidence: 0.9514645

01:08:53.130 --> 01:08:54.110 money off his subscriptions,

NOTE Confidence: 0.9085368

01:08:54.890 --> 01:08:56.055 he made us go faster.

NOTE Confidence: 0.9085368

01:08:56.055 --> 01:08:57.495 And, actually, congress got involved

NOTE Confidence: 0.9085368

01:08:57.495 --> 01:08:58.375 and they doubled down and

NOTE Confidence: 0.9085368

01:08:58.375 --> 01:08:59.675 they doubled the Genome Project's,

NOTE Confidence: 0.9825886

01:09:00.215 --> 01:09:01.415 funding to make us go

NOTE Confidence: 0.9825886

01:09:01.415 --> 01:09:02.695 faster. The Genome Project was

NOTE Confidence: 0.9825886

01:09:02.695 --> 01:09:03.975 originally slated to be fifteen

NOTE Confidence: 0.9825886

01:09:03.975 --> 01:09:05.015 years. I guess now I'm

NOTE Confidence: 0.9825886

01:09:05.015 --> 01:09:06.055 reflecting on this. I think

NOTE Confidence: 0.9825886

01:09:06.055 --> 01:09:07.015 it probably would have taken

NOTE Confidence: 0.9825886

01:09:07.015 --> 01:09:08.215 fifteen years. Craig made us

NOTE Confidence: 0.9825886

01:09:08.215 --> 01:09:09.255 go faster. We finished at

NOTE Confidence: 0.9825886

01:09:09.255 --> 01:09:09.755 thirteen.

NOTE Confidence: 0.9454679

01:09:10.316 --> 01:09:11.196 So any case, yeah, he

NOTE Confidence: 0.9454679

01:09:11.196 --> 01:09:12.396 passed away yesterday. He's been

NOTE Confidence: 0.9454679

01:09:12.396 --> 01:09:13.776 ill for quite a while.

NOTE Confidence: 0.9454679

01:09:13.916 --> 01:09:15.276 Thanks. Thanks very much. Okay.

NOTE Confidence: 0.9454679

01:09:15.276 --> 01:09:15.936 Thank you.