

WEBVTT

NOTE duration:"00:50:31"

NOTE recognizability:0.864

NOTE language:en-us

NOTE Confidence: 0.39786859

00:00:00.000 --> 00:00:04.959 Is to I got it. OK And then

NOTE Confidence: 0.39786859

00:00:04.959 --> 00:00:06.719 we got it. Got it here.

NOTE Confidence: 0.8349836033333333

00:00:10.360 --> 00:00:11.692 All right. Sorry everybody.

NOTE Confidence: 0.8349836033333333

00:00:11.692 --> 00:00:14.200 This is me doing this so that

NOTE Confidence: 0.8349836033333333

00:00:14.200 --> 00:00:16.480 Doctor Nye doesn't have to.

NOTE Confidence: 0.8349836033333333

00:00:16.480 --> 00:00:17.560 And that's important.

NOTE Confidence: 0.8349836033333333

00:00:17.560 --> 00:00:19.021 Chemistry and biology, remember,

NOTE Confidence: 0.8349836033333333

00:00:19.021 --> 00:00:21.307 because the one of the primary

NOTE Confidence: 0.8349836033333333

00:00:21.307 --> 00:00:23.632 goals of the BRAIN Initiative is

NOTE Confidence: 0.8349836033333333

00:00:23.632 --> 00:00:26.709 to develop new tools so that we can

NOTE Confidence: 0.8349836033333333

00:00:26.709 --> 00:00:29.301 push forward the ideas with the

NOTE Confidence: 0.8349836033333333

00:00:29.301 --> 00:00:31.080 technology that supports those ideas.

NOTE Confidence: 0.8349836033333333

00:00:31.080 --> 00:00:32.520 And of course we don't want

NOTE Confidence: 0.8349836033333333

00:00:32.520 --> 00:00:34.198 to be limited by technology.
NOTE Confidence: 0.8349836033333333

00:00:34.200 --> 00:00:35.895 So the development of new
NOTE Confidence: 0.8349836033333333

00:00:35.895 --> 00:00:38.006 technologies is a way to basically
NOTE Confidence: 0.8349836033333333

00:00:38.006 --> 00:00:40.435 free us up to be more creative.
NOTE Confidence: 0.8349836033333333

00:00:40.440 --> 00:00:41.960 And the
NOTE Confidence: 0.886453131538462

00:00:44.080 --> 00:00:45.886 his career then went on to get
NOTE Confidence: 0.886453131538462

00:00:45.886 --> 00:00:48.118 a PhD in biology from Caltech.
NOTE Confidence: 0.886453131538462

00:00:48.120 --> 00:00:50.056 He was a post doc at both Caltech
NOTE Confidence: 0.886453131538462

00:00:50.056 --> 00:00:52.266 and then at Columbia and then he
NOTE Confidence: 0.886453131538462

00:00:52.266 --> 00:00:53.976 started his faculty position at
NOTE Confidence: 0.886453131538462

00:00:53.976 --> 00:00:58.352 Berkeley and he there his lab was
NOTE Confidence: 0.886453131538462

00:00:58.352 --> 00:01:01.040 involved in olfactory neurobiology.
NOTE Confidence: 0.886453131538462

00:01:01.040 --> 00:01:04.847 He in his own work was pushing the boundaries
NOTE Confidence: 0.886453131538462

00:01:04.847 --> 00:01:07.240 particularly of molecular technologies.
NOTE Confidence: 0.886453131538462

00:01:07.240 --> 00:01:09.319 He had published you know way back,
NOTE Confidence: 0.886453131538462

00:01:09.320 --> 00:01:11.840 way back in the days and

NOTE Confidence: 0.886453131538462

00:01:11.840 --> 00:01:13.520 when we did microarrays,

NOTE Confidence: 0.886453131538462

00:01:13.520 --> 00:01:15.256 I don't know if any of you remember

NOTE Confidence: 0.886453131538462

00:01:15.256 --> 00:01:16.931 that he was already in this space

NOTE Confidence: 0.886453131538462

00:01:16.931 --> 00:01:18.771 and now of course has moved forward

NOTE Confidence: 0.886453131538462

00:01:18.771 --> 00:01:20.559 in that space towards the really

NOTE Confidence: 0.886453131538462

00:01:20.559 --> 00:01:22.084 cutting edge single cell technologies

NOTE Confidence: 0.886453131538462

00:01:22.084 --> 00:01:24.240 and so on that we use today.

NOTE Confidence: 0.886453131538462

00:01:24.240 --> 00:01:26.768 And he brings that knowledge to to his

NOTE Confidence: 0.886453131538462

00:01:26.768 --> 00:01:29.840 role as Director of the of the institute.

NOTE Confidence: 0.886453131538462

00:01:29.840 --> 00:01:32.430 He also served as director of Berkeley's

NOTE Confidence: 0.886453131538462

00:01:32.430 --> 00:01:34.298 Neuroscience Graduate program and of

NOTE Confidence: 0.886453131538462

00:01:34.298 --> 00:01:36.038 the Helen Wells Neuroscience Institute.

NOTE Confidence: 0.886453131538462

00:01:36.040 --> 00:01:40.020 So he comes into this with a lot

NOTE Confidence: 0.886453131538462

00:01:40.020 --> 00:01:40.996 of experience with students.

NOTE Confidence: 0.886453131538462

00:01:41.000 --> 00:01:42.872 So today he will be meeting

NOTE Confidence: 0.886453131538462

00:01:42.872 --> 00:01:44.120 with students for lunch.
NOTE Confidence: 0.886453131538462

00:01:44.120 --> 00:01:46.048 So I hope if any of you students
NOTE Confidence: 0.886453131538462

00:01:46.048 --> 00:01:48.173 are in the audience that are going
NOTE Confidence: 0.886453131538462

00:01:48.173 --> 00:01:50.463 to be having lunch with Doctor Nye
NOTE Confidence: 0.886453131538462

00:01:50.463 --> 00:01:52.395 after this that you take advantage
NOTE Confidence: 0.886453131538462

00:01:52.395 --> 00:01:54.762 of his of his experience.
NOTE Confidence: 0.886453131538462

00:01:54.762 --> 00:01:58.206 He's also served as Co Chair
NOTE Confidence: 0.886453131538462

00:01:58.206 --> 00:02:00.210 of the Brain Initiative,
NOTE Confidence: 0.886453131538462

00:02:00.210 --> 00:02:02.635 Cell Senses Consortium Steering Group
NOTE Confidence: 0.886453131538462

00:02:02.640 --> 00:02:04.726 and now he overseas the long term
NOTE Confidence: 0.886453131538462

00:02:04.726 --> 00:02:06.253 strategy and day-to-day operations of
NOTE Confidence: 0.886453131538462

00:02:06.253 --> 00:02:08.269 the NIH Brain Initiative as it strives
NOTE Confidence: 0.886453131538462

00:02:08.269 --> 00:02:09.949 to revolutionize our understanding of
NOTE Confidence: 0.886453131538462

00:02:09.949 --> 00:02:12.340 the brain and both health and disease.
NOTE Confidence: 0.886453131538462

00:02:12.340 --> 00:02:14.756 So I would like to welcome Doctor
NOTE Confidence: 0.886453131538462

00:02:14.756 --> 00:02:16.304 Nye and thank him very much

NOTE Confidence: 0.886453131538462
00:02:16.304 --> 00:02:17.599 for making the trip today.
NOTE Confidence: 0.835410128888889
00:02:23.600 --> 00:02:24.274 Thanks, Marina.
NOTE Confidence: 0.835410128888889
00:02:24.274 --> 00:02:26.633 I thank you all for being here.
NOTE Confidence: 0.835410128888889
00:02:26.640 --> 00:02:28.152 It's really a pleasure to get out of the.
NOTE Confidence: 0.835410128888889
00:02:28.160 --> 00:02:30.442 Get out of the house every now
NOTE Confidence: 0.835410128888889
00:02:30.442 --> 00:02:32.638 and then and see real folks.
NOTE Confidence: 0.835410128888889
00:02:32.640 --> 00:02:33.788 Yeah. Thank you, Marina,
NOTE Confidence: 0.835410128888889
00:02:33.788 --> 00:02:35.812 for the for organizing and John as
NOTE Confidence: 0.835410128888889
00:02:35.812 --> 00:02:37.520 well for the invitation to be here.
NOTE Confidence: 0.835410128888889
00:02:37.520 --> 00:02:39.824 It's really a delight.
NOTE Confidence: 0.835410128888889
00:02:39.824 --> 00:02:41.312 And just a touch screen.
NOTE Confidence: 0.835410128888889
00:02:41.312 --> 00:02:42.656 Do I dare? No, don't.
NOTE Confidence: 0.835410128888889
00:02:42.656 --> 00:02:43.640 Don't touch it.
NOTE Confidence: 0.835410128888889
00:02:43.640 --> 00:02:44.920 Don't touch it. OK,
NOTE Confidence: 0.738440355
00:02:47.320 --> 00:02:48.880 that so far. I had a wonderful visit.
NOTE Confidence: 0.738440355

00:02:48.880 --> 00:02:50.686 Really looking forward to meeting the
NOTE Confidence: 0.738440355

00:02:50.686 --> 00:02:52.409 students and other faculty as well
NOTE Confidence: 0.738440355

00:02:52.409 --> 00:02:54.160 later today. From what I can see,
NOTE Confidence: 0.738440355

00:02:54.160 --> 00:02:56.085 what's going on here really does align
NOTE Confidence: 0.738440355

00:02:56.085 --> 00:02:58.477 with what I'm going to tell you about what
NOTE Confidence: 0.738440355

00:02:58.477 --> 00:03:00.288 in our mission in the brain Initiative,
NOTE Confidence: 0.738440355

00:03:00.288 --> 00:03:02.205 as Marina said, to revolutionize our
NOTE Confidence: 0.738440355

00:03:02.205 --> 00:03:04.080 understanding of the human brain.
NOTE Confidence: 0.738440355

00:03:04.080 --> 00:03:08.274 So let me just see if this will work.
NOTE Confidence: 0.738440355

00:03:08.280 --> 00:03:11.072 OK, That works, right?
NOTE Confidence: 0.738440355

00:03:11.072 --> 00:03:12.160 We're good. OK, great.
NOTE Confidence: 0.675609874285714

00:03:14.400 --> 00:03:16.878 Do. What am I supposed to do?
NOTE Confidence: 0.675609874285714

00:03:16.880 --> 00:03:18.080 Oh, move my face out of the way.
NOTE Confidence: 0.41329798

00:03:20.280 --> 00:03:22.840 Is this of the mouse?
NOTE Confidence: 0.41329798

00:03:22.840 --> 00:03:25.045 You can see this is a technology
NOTE Confidence: 0.41329798

00:03:25.045 --> 00:03:26.992 initiative, and I'm the director.

NOTE Confidence: 0.41329798

00:03:26.992 --> 00:03:28.535 It's really, it's like you should

NOTE Confidence: 0.41329798

00:03:28.535 --> 00:03:30.080 all really be kind of worried.

NOTE Confidence: 0.741692852

00:03:33.640 --> 00:03:35.928 OK. How's that? Cool. Oh, but this,

NOTE Confidence: 0.741692852

00:03:35.928 --> 00:03:38.196 this this thing's still in the way.

NOTE Confidence: 0.741692852

00:03:38.200 --> 00:03:38.917 OK, yeah, great.

NOTE Confidence: 0.741692852

00:03:38.917 --> 00:03:40.920 I've only been doing this for three years.

NOTE Confidence: 0.741692852

00:03:40.920 --> 00:03:43.440 OK. So it's really a delight to be here,

NOTE Confidence: 0.741692852

00:03:43.440 --> 00:03:45.240 I think. And this audience doesn't

NOTE Confidence: 0.741692852

00:03:45.240 --> 00:03:47.347 need to be reminded of the vast

NOTE Confidence: 0.741692852

00:03:47.347 --> 00:03:49.045 complexity of the human brain and

NOTE Confidence: 0.741692852

00:03:49.045 --> 00:03:51.333 other other brains couple 100 billion

NOTE Confidence: 0.741692852

00:03:51.333 --> 00:03:53.278 cells making trillions of connections.

NOTE Confidence: 0.741692852

00:03:53.280 --> 00:03:54.960 It's the most powerful computer,

NOTE Confidence: 0.741692852

00:03:54.960 --> 00:03:57.032 I think, that we know of and certainly

NOTE Confidence: 0.741692852

00:03:57.032 --> 00:03:59.036 the most complex organ in the body,

NOTE Confidence: 0.741692852

00:03:59.040 --> 00:04:00.840 which also makes it most
NOTE Confidence: 0.741692852

00:04:00.840 --> 00:04:01.920 vulnerable to disease.
NOTE Confidence: 0.741692852

00:04:01.920 --> 00:04:04.360 So we the goal here is to develop new and
NOTE Confidence: 0.741692852

00:04:04.421 --> 00:04:06.869 better tools to understand this remarkable
NOTE Confidence: 0.741692852

00:04:06.869 --> 00:04:08.432 organ and eventually to understand
NOTE Confidence: 0.741692852

00:04:08.432 --> 00:04:10.640 how it works in health and disease.
NOTE Confidence: 0.741692852

00:04:10.640 --> 00:04:12.705 So we can start thinking about actual
NOTE Confidence: 0.741692852

00:04:12.705 --> 00:04:14.478 cures and not just ineffective treatment.
NOTE Confidence: 0.741692852

00:04:14.478 --> 00:04:17.146 So that's kind of the gist of what I'm
NOTE Confidence: 0.741692852

00:04:17.146 --> 00:04:18.914 going to get at to with you today.
NOTE Confidence: 0.741692852

00:04:18.920 --> 00:04:21.560 OK, so the mission of the
NOTE Confidence: 0.741692852

00:04:21.560 --> 00:04:22.880 US Brain Initiative,
NOTE Confidence: 0.741692852

00:04:22.880 --> 00:04:25.120 let me minimize my window here too,
NOTE Confidence: 0.741692852

00:04:25.120 --> 00:04:26.675 is to revolutionize our understanding
NOTE Confidence: 0.741692852

00:04:26.675 --> 00:04:28.758 of the human brain by accelerating
NOTE Confidence: 0.741692852

00:04:28.758 --> 00:04:30.654 the development and application

NOTE Confidence: 0.741692852

00:04:30.654 --> 00:04:32.076 of innovative technologies,

NOTE Confidence: 0.741692852

00:04:32.080 --> 00:04:33.520 Brain research through advancing

NOTE Confidence: 0.741692852

00:04:33.520 --> 00:04:34.600 innovative neuro technologies.

NOTE Confidence: 0.92207255

00:04:37.600 --> 00:04:39.154 It was announced as an initiative

NOTE Confidence: 0.92207255

00:04:39.154 --> 00:04:40.639 by the White House in 2013,

NOTE Confidence: 0.92207255

00:04:40.640 --> 00:04:43.520 with the first awards being made in 2014.

NOTE Confidence: 0.92207255

00:04:43.520 --> 00:04:45.284 And really the kind of the cool

NOTE Confidence: 0.92207255

00:04:45.284 --> 00:04:47.083 vision here was that it came at a

NOTE Confidence: 0.92207255

00:04:47.083 --> 00:04:48.755 time when there were advances and

NOTE Confidence: 0.92207255

00:04:48.755 --> 00:04:50.230 fields adjacent to biology and

NOTE Confidence: 0.92207255

00:04:50.283 --> 00:04:51.563 neuroscience that people recognize

NOTE Confidence: 0.92207255

00:04:51.563 --> 00:04:53.827 would actually help us in our quest

NOTE Confidence: 0.92207255

00:04:53.827 --> 00:04:55.567 to develop better tools to understand

NOTE Confidence: 0.92207255

00:04:55.567 --> 00:04:58.528 how this thing works and engineering,

NOTE Confidence: 0.92207255

00:04:58.528 --> 00:04:59.920 physics, chemistry,

NOTE Confidence: 0.92207255

00:04:59.920 --> 00:05:01.504 computer science and so and and
NOTE Confidence: 0.92207255

00:05:01.504 --> 00:05:03.520 and also in the social sciences.
NOTE Confidence: 0.92207255

00:05:03.520 --> 00:05:05.797 And this is really just a great a time
NOTE Confidence: 0.92207255

00:05:05.797 --> 00:05:08.276 of confluence to really leverage this,
NOTE Confidence: 0.92207255

00:05:08.280 --> 00:05:09.744 this, this huge,
NOTE Confidence: 0.92207255

00:05:09.744 --> 00:05:12.184 huge development in knowledge across
NOTE Confidence: 0.92207255

00:05:12.184 --> 00:05:14.560 across different and diverse fields.
NOTE Confidence: 0.92207255

00:05:14.560 --> 00:05:15.505 The BRAIN Initiative,
NOTE Confidence: 0.92207255

00:05:15.505 --> 00:05:17.080 the US BRAIN Initiative represents
NOTE Confidence: 0.92207255

00:05:17.080 --> 00:05:18.520 a partnership between five U.S.
NOTE Confidence: 0.92207255

00:05:18.520 --> 00:05:21.000 Federal agencies and private foundations.
NOTE Confidence: 0.92207255

00:05:21.000 --> 00:05:22.519 And our efforts at the NIH have
NOTE Confidence: 0.92207255

00:05:22.519 --> 00:05:24.159 been guided by two strategic plans.
NOTE Confidence: 0.92207255

00:05:24.160 --> 00:05:25.760 The first was the so-called
NOTE Confidence: 0.92207255

00:05:25.760 --> 00:05:27.120 BRAIN 2025 report.
NOTE Confidence: 0.92207255

00:05:27.120 --> 00:05:31.066 This was a report commissioned by then NIH,

NOTE Confidence: 0.92207255

00:05:31.066 --> 00:05:32.718 Director of Francis Collins,

NOTE Confidence: 0.92207255

00:05:32.720 --> 00:05:34.802 Advisor Counsel to the Director of

NOTE Confidence: 0.92207255

00:05:34.802 --> 00:05:36.903 Working group of that ACD we call

NOTE Confidence: 0.92207255

00:05:36.903 --> 00:05:38.680 it and that was chaired by Corey

NOTE Confidence: 0.92207255

00:05:38.680 --> 00:05:39.720 Bargman from Rockefeller University.

NOTE Confidence: 0.92207255

00:05:39.720 --> 00:05:41.335 I'm Bill Newsom at Stanford

NOTE Confidence: 0.92207255

00:05:41.335 --> 00:05:43.274 University and it really laid out

NOTE Confidence: 0.92207255

00:05:43.274 --> 00:05:45.136 the 1st 10 years of where they

NOTE Confidence: 0.92207255

00:05:45.136 --> 00:05:46.917 thought this thing could be going.

NOTE Confidence: 0.92207255

00:05:46.920 --> 00:05:48.960 An update to to the strategic plan was

NOTE Confidence: 0.92207255

00:05:48.960 --> 00:05:51.188 made in the brain two point O reports

NOTE Confidence: 0.92207255

00:05:51.188 --> 00:05:53.238 that was released in October of 2019.

NOTE Confidence: 0.92207255

00:05:53.240 --> 00:05:54.942 That kind of took a look at where

NOTE Confidence: 0.92207255

00:05:54.942 --> 00:05:56.470 things stood at the five years in and

NOTE Confidence: 0.92207255

00:05:56.520 --> 00:05:58.048 and a kind of a refreshed look at

NOTE Confidence: 0.92207255

00:05:58.048 --> 00:05:59.479 where things should go in the future.
NOTE Confidence: 0.92207255

00:05:59.480 --> 00:06:01.460 And everything we're doing is kind
NOTE Confidence: 0.92207255

00:06:01.460 --> 00:06:04.200 of based on these two visionary
NOTE Confidence: 0.92207255

00:06:04.200 --> 00:06:06.380 documents Now at the NIH.
NOTE Confidence: 0.92207255

00:06:06.380 --> 00:06:08.762 Our goal is to develop a new and
NOTE Confidence: 0.92207255

00:06:08.762 --> 00:06:10.712 apply new tools for understanding
NOTE Confidence: 0.92207255

00:06:10.712 --> 00:06:12.809 how neural circuits underlie complex
NOTE Confidence: 0.92207255

00:06:12.809 --> 00:06:15.395 behaviors in both health and disease.
NOTE Confidence: 0.92207255

00:06:15.400 --> 00:06:17.764 The initiative spans 10 of the
NOTE Confidence: 0.92207255

00:06:17.764 --> 00:06:20.040 27 NIH institutes or centers,
NOTE Confidence: 0.92207255

00:06:20.040 --> 00:06:21.438 I'll refer to those as ICS.
NOTE Confidence: 0.92207255

00:06:21.440 --> 00:06:23.596 And in order to achieve this goal,
NOTE Confidence: 0.92207255

00:06:23.600 --> 00:06:25.646 we feel it's important to leverage
NOTE Confidence: 0.92207255

00:06:25.646 --> 00:06:27.434 emerging technologies from across the
NOTE Confidence: 0.92207255

00:06:27.434 --> 00:06:29.264 scientific disciplines to enable new
NOTE Confidence: 0.92207255

00:06:29.264 --> 00:06:31.240 discoveries about neural circuit function,

NOTE Confidence: 0.92207255

00:06:31.240 --> 00:06:33.178 to use these discoveries as a

NOTE Confidence: 0.92207255

00:06:33.178 --> 00:06:34.875 foundation for new therapies for

NOTE Confidence: 0.92207255

00:06:34.875 --> 00:06:36.736 human brain disorders and very

NOTE Confidence: 0.92207255

00:06:36.736 --> 00:06:38.368 importantly to disseminate and

NOTE Confidence: 0.92207255

00:06:38.368 --> 00:06:39.592 democratize these technologies.

NOTE Confidence: 0.92207255

00:06:39.600 --> 00:06:41.854 We're both for discovery as well As

NOTE Confidence: 0.92207255

00:06:41.854 --> 00:06:43.455 for clinical applications and very

NOTE Confidence: 0.92207255

00:06:43.455 --> 00:06:45.195 importantly for the benefit of all.

NOTE Confidence: 0.92207255

00:06:45.200 --> 00:06:46.640 Now with the NIH BRAIN Initiative,

NOTE Confidence: 0.92207255

00:06:46.640 --> 00:06:47.230 we we've,

NOTE Confidence: 0.92207255

00:06:47.230 --> 00:06:49.295 we've mapped out what we're doing based

NOTE Confidence: 0.92207255

00:06:49.295 --> 00:06:53.598 on the BRAIN 2025 report in nine main areas.

NOTE Confidence: 0.92207255

00:06:53.600 --> 00:06:54.868 We study,

NOTE Confidence: 0.92207255

00:06:54.868 --> 00:06:55.502 we,

NOTE Confidence: 0.92207255

00:06:55.502 --> 00:06:59.300 we we fund studies looking at tools,

NOTE Confidence: 0.92207255

00:06:59.300 --> 00:07:01.820 tools that allow us to better
NOTE Confidence: 0.92207255

00:07:01.820 --> 00:07:04.277 understand cell and circuit functions,
NOTE Confidence: 0.92207255

00:07:04.280 --> 00:07:06.416 invasive and other non invasive neuro
NOTE Confidence: 0.92207255

00:07:06.416 --> 00:07:07.840 recording and modulation technologies.
NOTE Confidence: 0.92207255

00:07:07.840 --> 00:07:08.998 I'm going to touch on examples
NOTE Confidence: 0.92207255

00:07:08.998 --> 00:07:10.400 of all these as they go along.
NOTE Confidence: 0.92207255

00:07:10.400 --> 00:07:12.640 Newer neuro imaging technologies
NOTE Confidence: 0.92207255

00:07:12.640 --> 00:07:14.320 across different scales.
NOTE Confidence: 0.92207255

00:07:14.320 --> 00:07:16.912 We have a very robust portfolio
NOTE Confidence: 0.92207255

00:07:16.912 --> 00:07:18.640 in systems neuroscience where
NOTE Confidence: 0.92207255

00:07:18.640 --> 00:07:20.716 our program is designed to use,
NOTE Confidence: 0.92207255

00:07:20.720 --> 00:07:23.170 develop and use the latest tools for
NOTE Confidence: 0.92207255

00:07:23.170 --> 00:07:24.800 dissecting neuro circuit function.
NOTE Confidence: 0.92207255

00:07:24.800 --> 00:07:25.742 And very importantly,
NOTE Confidence: 0.92207255

00:07:25.742 --> 00:07:27.940 we have a robust program in human
NOTE Confidence: 0.910702689

00:07:28.003 --> 00:07:29.487 neuroscience which touches not

NOTE Confidence: 0.910702689

00:07:29.487 --> 00:07:31.713 only on developing first and human

NOTE Confidence: 0.910702689

00:07:31.720 --> 00:07:32.980 treatments for various disorders,

NOTE Confidence: 0.910702689

00:07:32.980 --> 00:07:35.959 but also to use the human brain as a

NOTE Confidence: 0.910702689

00:07:35.959 --> 00:07:37.669 model system for understanding neuro

NOTE Confidence: 0.910702689

00:07:37.669 --> 00:07:39.696 circuit function and kind of interleaves.

NOTE Confidence: 0.910702689

00:07:39.696 --> 00:07:41.032 Across these different programs

NOTE Confidence: 0.910702689

00:07:41.032 --> 00:07:42.923 we are supporting various efforts

NOTE Confidence: 0.910702689

00:07:42.923 --> 00:07:44.873 in data science and informatics,

NOTE Confidence: 0.910702689

00:07:44.880 --> 00:07:45.999 very important training,

NOTE Confidence: 0.910702689

00:07:45.999 --> 00:07:47.118 inclusion and equity.

NOTE Confidence: 0.910702689

00:07:47.120 --> 00:07:49.685 We need to make sure that this is a

NOTE Confidence: 0.910702689

00:07:49.685 --> 00:07:51.055 sustainable enterprise with bringing

NOTE Confidence: 0.910702689

00:07:51.055 --> 00:07:53.800 in new talent into the into the fold.

NOTE Confidence: 0.910702689

00:07:53.800 --> 00:07:55.040 Neuroethics, you know what we're

NOTE Confidence: 0.910702689

00:07:55.040 --> 00:07:56.032 doing matters for society,

NOTE Confidence: 0.910702689

00:07:56.040 --> 00:07:58.038 it matters for individuals and again,
NOTE Confidence: 0.910702689

00:07:58.040 --> 00:08:00.680 as I mentioned before, dissemination,
NOTE Confidence: 0.910702689

00:08:00.680 --> 00:08:03.719 democratization and commercialization.
NOTE Confidence: 0.910702689

00:08:03.720 --> 00:08:06.344 OK, just a very brief history of the
NOTE Confidence: 0.910702689

00:08:06.344 --> 00:08:08.080 funding of the BRAIN Initiative.
NOTE Confidence: 0.910702689

00:08:08.080 --> 00:08:11.095 It started in 2014 at NIH with a
NOTE Confidence: 0.910702689

00:08:11.095 --> 00:08:13.195 very modest \$46 million investment.
NOTE Confidence: 0.910702689

00:08:13.200 --> 00:08:15.513 And you can see it's grown quite a bit.
NOTE Confidence: 0.910702689

00:08:15.520 --> 00:08:17.391 And the last fiscal year, FY23,
NOTE Confidence: 0.910702689

00:08:17.391 --> 00:08:19.879 which just ended in September of this year,
NOTE Confidence: 0.910702689

00:08:19.880 --> 00:08:21.200 we made it,
NOTE Confidence: 0.910702689

00:08:21.200 --> 00:08:23.560 we had \$680 million to invest
NOTE Confidence: 0.910702689

00:08:23.560 --> 00:08:25.040 in in these studies.
NOTE Confidence: 0.910702689

00:08:25.040 --> 00:08:26.839 Our funding comes from 2 main sources.
NOTE Confidence: 0.910702689

00:08:26.840 --> 00:08:27.164 Well,
NOTE Confidence: 0.910702689

00:08:27.164 --> 00:08:28.784 two sources and dark blue

NOTE Confidence: 0.910702689

00:08:28.784 --> 00:08:30.080 is the base funding.

NOTE Confidence: 0.910702689

00:08:30.080 --> 00:08:33.279 So this represents funds that are allocated,

NOTE Confidence: 0.910702689

00:08:33.280 --> 00:08:34.672 appropriated by Congress to

NOTE Confidence: 0.910702689

00:08:34.672 --> 00:08:36.760 the NIH to these ten ICS.

NOTE Confidence: 0.910702689

00:08:36.760 --> 00:08:39.793 It's a line item in these ten IC budgets.

NOTE Confidence: 0.910702689

00:08:39.800 --> 00:08:41.573 On top of that in the light blue are

NOTE Confidence: 0.910702689

00:08:41.573 --> 00:08:43.318 funds from the 21st Century Cures Act,

NOTE Confidence: 0.910702689

00:08:43.320 --> 00:08:45.553 which was passed in 2016 that

NOTE Confidence: 0.910702689

00:08:45.553 --> 00:08:46.372 started in 2017.

NOTE Confidence: 0.910702689

00:08:46.372 --> 00:08:48.010 You can see it's a variable

NOTE Confidence: 0.910702689

00:08:48.074 --> 00:08:49.079 amount of funding.

NOTE Confidence: 0.910702689

00:08:49.080 --> 00:08:51.840 It runs through 2026 and it's

NOTE Confidence: 0.910702689

00:08:51.840 --> 00:08:54.490 really allowed us to pursue this

NOTE Confidence: 0.910702689

00:08:54.490 --> 00:08:56.515 robust growth of investments that

NOTE Confidence: 0.910702689

00:08:56.515 --> 00:08:58.789 really has catalyzed the field in

NOTE Confidence: 0.910702689

00:08:58.789 --> 00:09:00.444 terms of developing these tools
NOTE Confidence: 0.910702689

00:09:00.444 --> 00:09:02.278 for doing really cool stuff.
NOTE Confidence: 0.910702689

00:09:02.280 --> 00:09:02.584 OK,
NOTE Confidence: 0.910702689

00:09:02.584 --> 00:09:05.320 So what have we done since then since 2014?
NOTE Confidence: 0.910702689

00:09:05.320 --> 00:09:06.928 So these are the numbers we
NOTE Confidence: 0.910702689

00:09:06.928 --> 00:09:08.451 have since up through 2022.
NOTE Confidence: 0.910702689

00:09:08.451 --> 00:09:11.631 We funded by now actually over 1200
NOTE Confidence: 0.910702689

00:09:11.631 --> 00:09:13.986 PIS across over 230 institutions
NOTE Confidence: 0.910702689

00:09:13.986 --> 00:09:16.315 and they've they've been supported
NOTE Confidence: 0.910702689

00:09:16.315 --> 00:09:18.920 by now by over 1100 Brain Awards,
NOTE Confidence: 0.910702689

00:09:18.920 --> 00:09:20.820 they've published a bunch and
NOTE Confidence: 0.910702689

00:09:20.820 --> 00:09:22.732 they've published in journals
NOTE Confidence: 0.910702689

00:09:22.732 --> 00:09:24.196 covering different areas.
NOTE Confidence: 0.910702689

00:09:24.200 --> 00:09:26.200 So this reflects the multidisciplinary
NOTE Confidence: 0.910702689

00:09:26.200 --> 00:09:28.200 nature of what we're supporting.
NOTE Confidence: 0.910702689

00:09:28.200 --> 00:09:30.500 Here's a word cloud showing

NOTE Confidence: 0.910702689

00:09:30.500 --> 00:09:31.880 the common themes.

NOTE Confidence: 0.910702689

00:09:31.880 --> 00:09:33.476 One day I expect to see non

NOTE Confidence: 0.910702689

00:09:33.476 --> 00:09:34.800 rental cells better represented,

NOTE Confidence: 0.910702689

00:09:34.800 --> 00:09:37.154 but we're we're working on that and

NOTE Confidence: 0.910702689

00:09:37.154 --> 00:09:40.168 quite a few really nice publications. OK.

NOTE Confidence: 0.910702689

00:09:40.168 --> 00:09:43.432 So that's kind of brain by the numbers.

NOTE Confidence: 0.910702689

00:09:43.440 --> 00:09:45.240 Today I'd like to leave you

NOTE Confidence: 0.910702689

00:09:45.240 --> 00:09:46.440 with three key takeaways.

NOTE Confidence: 0.910702689

00:09:46.440 --> 00:09:48.204 The 1st is that brain funded

NOTE Confidence: 0.910702689

00:09:48.204 --> 00:09:50.040 advancements in tools and technology.

NOTE Confidence: 0.910702689

00:09:50.040 --> 00:09:50.940 They're already making their

NOTE Confidence: 0.910702689

00:09:50.940 --> 00:09:51.840 way into the clinic.

NOTE Confidence: 0.910702689

00:09:51.840 --> 00:09:54.325 So we see we're already seeing big

NOTE Confidence: 0.910702689

00:09:54.325 --> 00:09:56.320 potential to impact humans today,

NOTE Confidence: 0.910702689

00:09:56.320 --> 00:09:59.038 not just sometime in the future,

NOTE Confidence: 0.910702689

00:09:59.040 --> 00:09:59.780 but in the meantime,
NOTE Confidence: 0.910702689

00:09:59.780 --> 00:10:00.520 as I mentioned before,
NOTE Confidence: 0.910702689

00:10:00.520 --> 00:10:02.508 we really do need to understand more
NOTE Confidence: 0.910702689

00:10:02.508 --> 00:10:04.639 about the brain in order to to come
NOTE Confidence: 0.910702689

00:10:04.639 --> 00:10:06.800 up with some actual cures and preventions.
NOTE Confidence: 0.910702689

00:10:06.800 --> 00:10:08.912 And here our teams are developing
NOTE Confidence: 0.910702689

00:10:08.912 --> 00:10:10.320 new resources and technologies
NOTE Confidence: 0.910702689

00:10:10.383 --> 00:10:12.033 that are laying the foundation
NOTE Confidence: 0.910702689

00:10:12.033 --> 00:10:13.353 for these future cures.
NOTE Confidence: 0.910702689

00:10:13.360 --> 00:10:14.312 And in the process,
NOTE Confidence: 0.910702689

00:10:14.312 --> 00:10:16.363 of course generating in a lot of great
NOTE Confidence: 0.910702689

00:10:16.363 --> 00:10:18.073 information about how the brain works.
NOTE Confidence: 0.910702689

00:10:18.080 --> 00:10:19.280 And then finally,
NOTE Confidence: 0.910702689

00:10:19.280 --> 00:10:21.480 kind of part of all this is
NOTE Confidence: 0.910702689

00:10:21.480 --> 00:10:22.880 that we're creating a new
NOTE Confidence: 0.9288298264

00:10:22.950 --> 00:10:25.470 way of doing science that we feel is and

NOTE Confidence: 0.9288298264

00:10:25.470 --> 00:10:27.876 will accelerate the pace of discovery.

NOTE Confidence: 0.9288298264

00:10:27.880 --> 00:10:30.080 OK. So I'm just going to go through

NOTE Confidence: 0.9288298264

00:10:30.080 --> 00:10:32.128 each of these three points and

NOTE Confidence: 0.9288298264

00:10:32.128 --> 00:10:34.276 give you some examples and little

NOTE Confidence: 0.9288298264

00:10:34.344 --> 00:10:37.160 vignettes to support these claims. OK.

NOTE Confidence: 0.9288298264

00:10:37.160 --> 00:10:40.480 So what's going on in the clinic today?

NOTE Confidence: 0.9288298264

00:10:40.480 --> 00:10:42.613 Well, I'm sure a lot of you are aware

NOTE Confidence: 0.9288298264

00:10:42.613 --> 00:10:45.423 or almost all of you are aware of deep

NOTE Confidence: 0.9288298264

00:10:45.423 --> 00:10:47.250 brain stimulation that's been used for

NOTE Confidence: 0.9288298264

00:10:47.250 --> 00:10:49.680 over 2 decades now to treat the symptoms,

NOTE Confidence: 0.9288298264

00:10:49.680 --> 00:10:51.480 the motor symptoms of Parkinson's

NOTE Confidence: 0.9288298264

00:10:51.480 --> 00:10:53.679 disease and other movement disorders.

NOTE Confidence: 0.9288298264

00:10:53.680 --> 00:10:55.040 And it's kind of been great for that.

NOTE Confidence: 0.9288298264

00:10:55.040 --> 00:10:56.840 It's the gold standard for treating

NOTE Confidence: 0.9288298264

00:10:56.840 --> 00:10:58.040 patients with these conditions.

NOTE Confidence: 0.9288298264

00:10:58.040 --> 00:11:00.679 But applying it to other arguably more
NOTE Confidence: 0.9288298264

00:11:00.679 --> 00:11:02.480 complex conditions like treatment,
NOTE Confidence: 0.9288298264

00:11:02.480 --> 00:11:05.846 refractory depression, OCDPTSD,
NOTE Confidence: 0.9288298264

00:11:05.846 --> 00:11:08.782 things like this has been not really
NOTE Confidence: 0.9288298264

00:11:08.782 --> 00:11:11.239 been going so well until very recently.
NOTE Confidence: 0.9288298264

00:11:11.240 --> 00:11:13.560 And we're now we're seeing kind of a
NOTE Confidence: 0.9288298264

00:11:13.560 --> 00:11:15.957 whole bumper crop of papers and studies
NOTE Confidence: 0.9288298264

00:11:15.957 --> 00:11:18.375 showing the application to these more
NOTE Confidence: 0.9288298264

00:11:18.375 --> 00:11:20.199 complex neuropsychiatric conditions.
NOTE Confidence: 0.9288298264

00:11:20.200 --> 00:11:21.013 So what's changed?
NOTE Confidence: 0.9288298264

00:11:21.013 --> 00:11:22.639 Well, a couple things has changed.
NOTE Confidence: 0.9288298264

00:11:22.640 --> 00:11:24.953 One is that we are seeing in addition to
NOTE Confidence: 0.9288298264

00:11:24.953 --> 00:11:26.974 these devices in addition to stimulating
NOTE Confidence: 0.9288298264

00:11:26.974 --> 00:11:29.240 that can now record neural activity.
NOTE Confidence: 0.9288298264

00:11:29.240 --> 00:11:32.000 So there's a possibility of recording
NOTE Confidence: 0.9288298264

00:11:32.000 --> 00:11:34.759 activity in the brains of patients

NOTE Confidence: 0.9288298264
00:11:34.760 --> 00:11:36.588 and identifying neural activity
NOTE Confidence: 0.9288298264
00:11:36.588 --> 00:11:38.873 biomarkers for the conditions that
NOTE Confidence: 0.9288298264
00:11:38.873 --> 00:11:40.920 could be stimulated back into,
NOTE Confidence: 0.9288298264
00:11:40.920 --> 00:11:42.000 we might think,
NOTE Confidence: 0.9288298264
00:11:42.000 --> 00:11:43.080 a better space.
NOTE Confidence: 0.9288298264
00:11:43.080 --> 00:11:45.600 Another big advance has been the
NOTE Confidence: 0.9288298264
00:11:45.600 --> 00:11:48.564 the development of these really cool
NOTE Confidence: 0.9288298264
00:11:48.564 --> 00:11:50.046 artificial intelligence algorithms
NOTE Confidence: 0.9288298264
00:11:50.046 --> 00:11:52.297 that can actually deconvolve and
NOTE Confidence: 0.9288298264
00:11:52.297 --> 00:11:53.985 interpret that information to
NOTE Confidence: 0.9288298264
00:11:53.985 --> 00:11:56.690 kind of give give us actionable
NOTE Confidence: 0.9288298264
00:11:56.690 --> 00:11:58.478 biomarkers for the stimulation.
NOTE Confidence: 0.9288298264
00:11:58.480 --> 00:12:01.015 And then finally better mapping on
NOTE Confidence: 0.9288298264
00:12:01.015 --> 00:12:03.265 an individual basis of patients of
NOTE Confidence: 0.9288298264
00:12:03.265 --> 00:12:05.117 their actual pathways and circuits
NOTE Confidence: 0.9288298264

00:12:05.117 --> 00:12:07.427 so that the electrodes can be placed
NOTE Confidence: 0.9288298264

00:12:07.427 --> 00:12:09.513 in the ideal location and record
NOTE Confidence: 0.9288298264

00:12:09.513 --> 00:12:11.770 and stimulate in such a way that
NOTE Confidence: 0.9288298264

00:12:11.770 --> 00:12:13.195 can give an effective treatment.
NOTE Confidence: 0.9288298264

00:12:13.200 --> 00:12:14.433 So this has been going on for a while.
NOTE Confidence: 0.9288298264

00:12:14.440 --> 00:12:17.104 Here's just one example of one of these
NOTE Confidence: 0.9288298264

00:12:17.104 --> 00:12:20.560 studies published just this past fall
NOTE Confidence: 0.9288298264

00:12:20.560 --> 00:12:22.555 from Helen Mayberg and Chris Rozell's Group,
NOTE Confidence: 0.9288298264

00:12:22.560 --> 00:12:24.560 A really great collaboration between
NOTE Confidence: 0.9288298264

00:12:24.560 --> 00:12:26.395 neurologist Helen Mayberg's been been
NOTE Confidence: 0.9288298264

00:12:26.395 --> 00:12:28.966 been pushing this for about two decades
NOTE Confidence: 0.9288298264

00:12:28.966 --> 00:12:31.000 and Chris Rizzell who's an engineer.
NOTE Confidence: 0.9288298264

00:12:31.000 --> 00:12:32.700 So again embodying the ethos
NOTE Confidence: 0.9288298264

00:12:32.700 --> 00:12:34.400 of the brain initiative using
NOTE Confidence: 0.9288298264

00:12:34.460 --> 00:12:36.160 multidisciplinary approaches.
NOTE Confidence: 0.9288298264

00:12:36.160 --> 00:12:37.200 So here they had about,

NOTE Confidence: 0.9288298264

00:12:37.200 --> 00:12:39.356 I think it was 12 patients that

NOTE Confidence: 0.9288298264

00:12:39.356 --> 00:12:40.280 had we're suffering,

NOTE Confidence: 0.9288298264

00:12:40.280 --> 00:12:43.944 we're living with chronic and

NOTE Confidence: 0.9288298264

00:12:43.944 --> 00:12:46.508 treatment resistant depression and

NOTE Confidence: 0.9288298264

00:12:46.508 --> 00:12:49.076 placing the electrodes in the singlet

NOTE Confidence: 0.9288298264

00:12:49.076 --> 00:12:51.770 very precisely and being able to

NOTE Confidence: 0.9288298264

00:12:51.770 --> 00:12:54.000 record activity from these patients.

NOTE Confidence: 0.9288298264

00:12:54.000 --> 00:12:55.914 They were actually able to derive

NOTE Confidence: 0.9288298264

00:12:55.914 --> 00:12:58.051 using AI really cool AI techniques

NOTE Confidence: 0.9288298264

00:12:58.051 --> 00:13:00.036 biomarkers for the patient state.

NOTE Confidence: 0.9288298264

00:13:00.040 --> 00:13:01.960 So they would implant these patients,

NOTE Confidence: 0.9288298264

00:13:01.960 --> 00:13:03.616 they stimulate them.

NOTE Confidence: 0.9288298264

00:13:03.616 --> 00:13:06.495 I think 3/4 of them actually either

NOTE Confidence: 0.9288298264

00:13:06.495 --> 00:13:08.756 showed a great response to the

NOTE Confidence: 0.9288298264

00:13:08.756 --> 00:13:11.328 stimulation if not remission and they

NOTE Confidence: 0.9288298264

00:13:11.328 --> 00:13:13.992 can actually use the this biomarker
NOTE Confidence: 0.9288298264

00:13:13.992 --> 00:13:16.680 activity to predict how they were doing.
NOTE Confidence: 0.9288298264

00:13:16.680 --> 00:13:19.839 And in fact in in in one or a few cases,
NOTE Confidence: 0.9288298264

00:13:19.840 --> 00:13:21.456 they could predict a month in advance when
NOTE Confidence: 0.9288298264

00:13:21.456 --> 00:13:22.839 the patient was getting into trouble.
NOTE Confidence: 0.9288298264

00:13:22.840 --> 00:13:25.396 So this is a great way to not only
NOTE Confidence: 0.9288298264

00:13:25.400 --> 00:13:27.518 understand what's going on over time,
NOTE Confidence: 0.966196976666667

00:13:27.520 --> 00:13:29.604 but actually as a way of of
NOTE Confidence: 0.966196976666667

00:13:29.604 --> 00:13:31.024 tuning the the therapy before
NOTE Confidence: 0.966196976666667

00:13:31.024 --> 00:13:32.640 the patient gets into trouble.
NOTE Confidence: 0.966196976666667

00:13:32.640 --> 00:13:34.600 So this is really kind of cool stuff
NOTE Confidence: 0.966196976666667

00:13:34.600 --> 00:13:36.480 and now the challenge with all these DBS
NOTE Confidence: 0.966196976666667

00:13:36.480 --> 00:13:37.838 technologies is how do you scale it.
NOTE Confidence: 0.966196976666667

00:13:37.840 --> 00:13:39.880 These are again our small case
NOTE Confidence: 0.966196976666667

00:13:39.880 --> 00:13:41.240 or small patient studies,
NOTE Confidence: 0.966196976666667

00:13:41.240 --> 00:13:43.960 but it really does pave the way for

NOTE Confidence: 0.966196976666667

00:13:43.960 --> 00:13:46.620 for thinking about how we can treat

NOTE Confidence: 0.966196976666667

00:13:46.620 --> 00:13:49.178 these otherwise debilitating disorders.

NOTE Confidence: 0.966196976666667

00:13:49.178 --> 00:13:51.356 Treatment resistant depression,

NOTE Confidence: 0.966196976666667

00:13:51.360 --> 00:13:52.964 OCDPTSD, Bingeing eating disorder.

NOTE Confidence: 0.966196976666667

00:13:52.964 --> 00:13:55.370 Eddie Chang's group at UCSF has

NOTE Confidence: 0.966196976666667

00:13:55.440 --> 00:13:57.205 now been able to record activity

NOTE Confidence: 0.966196976666667

00:13:57.205 --> 00:13:59.030 by markers associated with chronic

NOTE Confidence: 0.966196976666667

00:13:59.030 --> 00:14:01.093 pain and now they're really working

NOTE Confidence: 0.966196976666667

00:14:01.093 --> 00:14:03.277 hard to see if they can't use DBS

NOTE Confidence: 0.966196976666667

00:14:03.341 --> 00:14:05.276 to alleviate those those symptoms,

NOTE Confidence: 0.966196976666667

00:14:05.280 --> 00:14:06.560 which has great implications not

NOTE Confidence: 0.966196976666667

00:14:06.560 --> 00:14:07.840 only for treating the pain,

NOTE Confidence: 0.966196976666667

00:14:07.840 --> 00:14:11.998 but also adjacently for for avoiding the

NOTE Confidence: 0.966196976666667

00:14:11.998 --> 00:14:15.040 consequences of substance use disorder.

NOTE Confidence: 0.966196976666667

00:14:15.040 --> 00:14:18.240 OK, here's a somewhat different study.

NOTE Confidence: 0.966196976666667

00:14:18.240 --> 00:14:20.424 This is from Kappa Kappa GROSSA
NOTE Confidence: 0.966196976666667

00:14:20.424 --> 00:14:21.516 Group and Pittsburgh,
NOTE Confidence: 0.966196976666667

00:14:21.520 --> 00:14:23.140 where they're looking at now
NOTE Confidence: 0.966196976666667

00:14:23.140 --> 00:14:24.436 not deep brain stimulation,
NOTE Confidence: 0.966196976666667

00:14:24.440 --> 00:14:27.597 but epidural stimulation of the spinal cord.
NOTE Confidence: 0.966196976666667

00:14:27.600 --> 00:14:29.370 So here we have patients that
NOTE Confidence: 0.966196976666667

00:14:29.370 --> 00:14:29.960 suffered stroke.
NOTE Confidence: 0.966196976666667

00:14:29.960 --> 00:14:30.779 And in fact,
NOTE Confidence: 0.966196976666667

00:14:30.779 --> 00:14:33.048 the case study that I'll show you here
NOTE Confidence: 0.966196976666667

00:14:33.048 --> 00:14:35.078 was a woman who suffered a stroke,
NOTE Confidence: 0.966196976666667

00:14:35.080 --> 00:14:35.994 I believe,
NOTE Confidence: 0.966196976666667

00:14:35.994 --> 00:14:39.193 nine years before the study was conducted.
NOTE Confidence: 0.966196976666667

00:14:39.200 --> 00:14:41.531 And the idea here is that there's
NOTE Confidence: 0.966196976666667

00:14:41.531 --> 00:14:42.596 a stroke thinks,
NOTE Confidence: 0.966196976666667

00:14:42.596 --> 00:14:45.368 I think it was a thalamic stroke
NOTE Confidence: 0.966196976666667

00:14:45.368 --> 00:14:47.120 affecting the transmission of

NOTE Confidence: 0.966196976666667
00:14:47.120 --> 00:14:49.520 information down the cortical spinal
NOTE Confidence: 0.966196976666667
00:14:49.520 --> 00:14:52.200 tract to move the upper limbs.
NOTE Confidence: 0.966196976666667
00:14:52.200 --> 00:14:52.580 OK.
NOTE Confidence: 0.966196976666667
00:14:52.580 --> 00:14:54.480 And as it turns out,
NOTE Confidence: 0.966196976666667
00:14:54.480 --> 00:14:56.356 there are local circuits in the spinal
NOTE Confidence: 0.966196976666667
00:14:56.356 --> 00:14:57.880 cord that control this movement.
NOTE Confidence: 0.966196976666667
00:14:57.880 --> 00:14:59.917 So it's not just like you're you're
NOTE Confidence: 0.966196976666667
00:14:59.920 --> 00:15:01.228 flipping a switch that goes right
NOTE Confidence: 0.966196976666667
00:15:01.228 --> 00:15:02.719 to your hands or your fingers,
NOTE Confidence: 0.966196976666667
00:15:02.720 --> 00:15:05.710 but you're actually engaging the
NOTE Confidence: 0.966196976666667
00:15:05.710 --> 00:15:07.240 local surface in the spinal cord.
NOTE Confidence: 0.966196976666667
00:15:07.240 --> 00:15:09.598 So the idea here is that if the signal
NOTE Confidence: 0.966196976666667
00:15:09.598 --> 00:15:11.717 traveling to the spinal cord is diminished,
NOTE Confidence: 0.966196976666667
00:15:11.720 --> 00:15:14.036 maybe one can get some recovery
NOTE Confidence: 0.966196976666667
00:15:14.036 --> 00:15:15.986 of function by amplifying the
NOTE Confidence: 0.966196976666667

00:15:15.986 --> 00:15:17.676 output in the spinal cord.
NOTE Confidence: 0.966196976666667

00:15:17.680 --> 00:15:19.878 So here in a less invasive technique,
NOTE Confidence: 0.966196976666667

00:15:19.880 --> 00:15:21.612 they've laid electrodes epidurally
NOTE Confidence: 0.966196976666667

00:15:21.612 --> 00:15:24.748 over the spinal cord in the cervical
NOTE Confidence: 0.966196976666667

00:15:24.748 --> 00:15:26.913 spinal cord and stimulation was
NOTE Confidence: 0.966196976666667

00:15:26.913 --> 00:15:28.557 optimized for each patient.
NOTE Confidence: 0.966196976666667

00:15:28.560 --> 00:15:30.135 I'm not going to bother going through
NOTE Confidence: 0.966196976666667

00:15:30.135 --> 00:15:31.414 these these graphs because I have
NOTE Confidence: 0.966196976666667

00:15:31.414 --> 00:15:32.709 a much better video to show you
NOTE Confidence: 0.966196976666667

00:15:32.755 --> 00:15:34.112 what's going on and the really cool,
NOTE Confidence: 0.966196976666667

00:15:34.112 --> 00:15:35.240 there are two really cool things.
NOTE Confidence: 0.966196976666667

00:15:35.240 --> 00:15:37.490 One is that the benefits once
NOTE Confidence: 0.966196976666667

00:15:37.490 --> 00:15:39.845 they turn the stimulator on were
NOTE Confidence: 0.966196976666667

00:15:39.845 --> 00:15:41.292 immediate in terms of giving,
NOTE Confidence: 0.966196976666667

00:15:41.292 --> 00:15:42.607 functional recovery of the arm
NOTE Confidence: 0.966196976666667

00:15:42.607 --> 00:15:44.440 and it lasted at least four weeks

NOTE Confidence: 0.966196976666667
00:15:44.440 --> 00:15:45.800 after they stopped the study.
NOTE Confidence: 0.966196976666667
00:15:45.800 --> 00:15:48.080 So that tells us two things.
NOTE Confidence: 0.966196976666667
00:15:48.080 --> 00:15:52.080 One is that the circuits are there to
NOTE Confidence: 0.966196976666667
00:15:52.080 --> 00:15:54.277 be engaged and you just have to engage them.
NOTE Confidence: 0.966196976666667
00:15:54.280 --> 00:15:56.020 And the other is there's probably
NOTE Confidence: 0.966196976666667
00:15:56.020 --> 00:15:57.639 some plasticity going on as well.
NOTE Confidence: 0.966196976666667
00:15:57.640 --> 00:16:00.680 OK, so a picture is worth 1000 words.
NOTE Confidence: 0.966196976666667
00:16:00.680 --> 00:16:02.018 A video's worth,
NOTE Confidence: 0.966196976666667
00:16:02.018 --> 00:16:05.040 I think 1,000,000 here is just
NOTE Confidence: 0.966196976666667
00:16:05.040 --> 00:16:07.840 this patient in the clinic,
NOTE Confidence: 0.966196976666667
00:16:07.840 --> 00:16:10.696 and the task here is to feed herself
NOTE Confidence: 0.966196976666667
00:16:10.696 --> 00:16:13.436 something that most of us take for granted.
NOTE Confidence: 0.966196976666667
00:16:13.440 --> 00:16:16.392 And so she is supposed to pick up this,
NOTE Confidence: 0.966196976666667
00:16:16.400 --> 00:16:18.518 I think it's a chicken nugget.
NOTE Confidence: 0.966196976666667
00:16:18.520 --> 00:16:21.000 Dip it in the sauce and put it in her
NOTE Confidence: 0.929230567894737

00:16:21.071 --> 00:16:23.626 mouth and you can see she's struggling

NOTE Confidence: 0.929230567894737

00:16:23.626 --> 00:16:25.360 with this. But she's a good sport.

NOTE Confidence: 0.929230567894737

00:16:25.360 --> 00:16:26.795 She's really kind of working at it.

NOTE Confidence: 0.96351245

00:16:29.360 --> 00:16:31.625 This was done during COVID

NOTE Confidence: 0.96351245

00:16:31.625 --> 00:16:32.959 times, hence the masks.

NOTE Confidence: 0.833421434285714

00:16:36.280 --> 00:16:37.918 She can barely lift her arm up

NOTE Confidence: 0.941500644

00:16:40.200 --> 00:16:43.704 and and she needs a little

NOTE Confidence: 0.941500644

00:16:43.704 --> 00:16:46.799 help at the end to get there.

NOTE Confidence: 0.88905654

00:16:49.600 --> 00:16:51.120 OK, so the next clip,

NOTE Confidence: 0.672184644

00:16:53.680 --> 00:16:54.880 the stimulator is turned on.

NOTE Confidence: 0.672184644

00:16:54.880 --> 00:16:58.760 So just an epidural stimulator.

NOTE Confidence: 0.672184644

00:16:58.760 --> 00:17:00.106 Still fine.

NOTE Confidence: 0.672184644

00:17:00.106 --> 00:17:03.034 Motor skills are still impacted,

NOTE Confidence: 0.672184644

00:17:03.034 --> 00:17:04.438 but she's doing a bit better,

NOTE Confidence: 0.672184644

00:17:04.440 --> 00:17:05.514 A little bit of help getting

NOTE Confidence: 0.672184644

00:17:05.514 --> 00:17:06.480 her fork in her hand,

NOTE Confidence: 0.672184644

00:17:06.480 --> 00:17:07.804 but she's holding the

NOTE Confidence: 0.672184644

00:17:07.804 --> 00:17:09.160 fork pretty well. Dip

NOTE Confidence: 0.966243938571428

00:17:12.800 --> 00:17:14.216 and there you go.

NOTE Confidence: 0.966243938571428

00:17:14.216 --> 00:17:15.278 Really quite remarkable.

NOTE Confidence: 0.966243938571428

00:17:15.280 --> 00:17:16.940 No physical therapy involved.

NOTE Confidence: 0.966243938571428

00:17:16.940 --> 00:17:19.430 This is just turning the stimulator

NOTE Confidence: 0.966243938571428

00:17:19.499 --> 00:17:21.455 on and it happens immediately and

NOTE Confidence: 0.966243938571428

00:17:21.455 --> 00:17:23.170 it lasts for weeks afterwards.

NOTE Confidence: 0.966243938571428

00:17:23.170 --> 00:17:24.995 And this parallels other studies

NOTE Confidence: 0.966243938571428

00:17:24.995 --> 00:17:27.837 done by this group as well as Greg

NOTE Confidence: 0.966243938571428

00:17:27.837 --> 00:17:29.517 Cortine in Switzerland where they've

NOTE Confidence: 0.966243938571428

00:17:29.584 --> 00:17:31.260 done similar epidural stimulation

NOTE Confidence: 0.966243938571428

00:17:31.260 --> 00:17:33.355 in spinal cord injury patients.

NOTE Confidence: 0.966243938571428

00:17:33.360 --> 00:17:35.928 Again, re engaging or amplifying the

NOTE Confidence: 0.966243938571428

00:17:35.928 --> 00:17:38.915 signal in the lumbar spinal cord to

NOTE Confidence: 0.966243938571428

00:17:38.915 --> 00:17:41.315 help movement of the lower limbs.
NOTE Confidence: 0.966243938571428

00:17:41.320 --> 00:17:42.805 And they've actually been able
NOTE Confidence: 0.966243938571428

00:17:42.805 --> 00:17:45.027 to identify and map the cells and
NOTE Confidence: 0.966243938571428

00:17:45.027 --> 00:17:46.717 circuits that show the plasticity
NOTE Confidence: 0.966243938571428

00:17:46.720 --> 00:17:48.013 using various techniques.
NOTE Confidence: 0.966243938571428

00:17:48.013 --> 00:17:51.030 So this is really showing great promise
NOTE Confidence: 0.966243938571428

00:17:51.097 --> 00:17:53.440 for how to assist patients recover
NOTE Confidence: 0.966243938571428

00:17:53.440 --> 00:17:56.240 function after these traumatic events.
NOTE Confidence: 0.966243938571428

00:17:56.240 --> 00:17:56.531 OK.
NOTE Confidence: 0.966243938571428

00:17:56.531 --> 00:17:58.277 So these are just two examples.
NOTE Confidence: 0.966243938571428

00:17:58.280 --> 00:17:59.512 There's a lot of other cool stuff
NOTE Confidence: 0.966243938571428

00:17:59.512 --> 00:18:00.520 going on in this space,
NOTE Confidence: 0.966243938571428

00:18:00.520 --> 00:18:02.295 including with deeper in stimulation
NOTE Confidence: 0.966243938571428

00:18:02.295 --> 00:18:03.360 for motor recovery.
NOTE Confidence: 0.966243938571428

00:18:03.360 --> 00:18:06.090 But just thought I'd give you 2
NOTE Confidence: 0.966243938571428

00:18:06.090 --> 00:18:08.560 brief vignettes for how we're taking

NOTE Confidence: 0.966243938571428
00:18:08.560 --> 00:18:10.336 technologies and pushing them into the
NOTE Confidence: 0.966243938571428
00:18:10.336 --> 00:18:12.359 clinic in these first in human trials.
NOTE Confidence: 0.966243938571428
00:18:12.360 --> 00:18:12.878 And now,
NOTE Confidence: 0.966243938571428
00:18:12.878 --> 00:18:13.396 of course,
NOTE Confidence: 0.966243938571428
00:18:13.396 --> 00:18:15.400 the challenge is to expand these studies,
NOTE Confidence: 0.966243938571428
00:18:15.400 --> 00:18:17.986 to validate them in randomized trials
NOTE Confidence: 0.966243938571428
00:18:17.986 --> 00:18:20.919 and then to disseminate it more broadly.
NOTE Confidence: 0.966243938571428
00:18:20.920 --> 00:18:22.320 OK.
NOTE Confidence: 0.966243938571428
00:18:22.320 --> 00:18:23.372 So the second key,
NOTE Confidence: 0.966243938571428
00:18:23.372 --> 00:18:25.719 key take away is that our teams are
NOTE Confidence: 0.966243938571428
00:18:25.719 --> 00:18:27.837 developing new resources that are laying
NOTE Confidence: 0.966243938571428
00:18:27.837 --> 00:18:30.280 down the foundation for future cures.
NOTE Confidence: 0.966243938571428
00:18:30.280 --> 00:18:32.145 We need more information about
NOTE Confidence: 0.966243938571428
00:18:32.145 --> 00:18:35.205 how brain cell types and circuits
NOTE Confidence: 0.966243938571428
00:18:35.205 --> 00:18:37.353 work to underpin behavior,
NOTE Confidence: 0.966243938571428

00:18:37.360 --> 00:18:38.440 so here are just a couple
NOTE Confidence: 0.966243938571428

00:18:38.440 --> 00:18:39.360 of examples I'll give you,
NOTE Confidence: 0.966243938571428

00:18:39.360 --> 00:18:42.756 some of which was done locally.
NOTE Confidence: 0.966243938571428

00:18:42.760 --> 00:18:45.976 One of the goals of systems
NOTE Confidence: 0.966243938571428

00:18:45.976 --> 00:18:48.656 in circus neuroscience is to
NOTE Confidence: 0.966243938571428

00:18:48.656 --> 00:18:51.120 understand how activity patterns Dr.
NOTE Confidence: 0.966243938571428

00:18:51.120 --> 00:18:51.811 downstream,
NOTE Confidence: 0.966243938571428

00:18:51.811 --> 00:18:54.575 other downstream units or
NOTE Confidence: 0.966243938571428

00:18:54.575 --> 00:18:55.957 ultimately behavior.
NOTE Confidence: 0.966243938571428

00:18:55.960 --> 00:18:57.910 We've seen a lot of progress
NOTE Confidence: 0.966243938571428

00:18:57.910 --> 00:18:59.787 in studying this using optical
NOTE Confidence: 0.966243938571428

00:18:59.787 --> 00:19:01.827 methods with genetically encoded
NOTE Confidence: 0.966243938571428

00:19:01.827 --> 00:19:03.357 calcium sensor sensors.
NOTE Confidence: 0.966243938571428

00:19:03.360 --> 00:19:05.978 But calcium is just a proxy for
NOTE Confidence: 0.966243938571428

00:19:05.978 --> 00:19:07.999 neural activity in most cases.
NOTE Confidence: 0.966243938571428

00:19:08.000 --> 00:19:09.656 And what what the field has

NOTE Confidence: 0.966243938571428
00:19:09.656 --> 00:19:11.821 really been driving at is to get
NOTE Confidence: 0.966243938571428
00:19:11.821 --> 00:19:13.481 direct sensors of voltage membrane
NOTE Confidence: 0.966243938571428
00:19:13.481 --> 00:19:14.811 voltage because that's really
NOTE Confidence: 0.966243938571428
00:19:14.811 --> 00:19:16.635 the currency in in most cases.
NOTE Confidence: 0.966243938571428
00:19:16.640 --> 00:19:18.212 Sorry for the pun of how
NOTE Confidence: 0.966243938571428
00:19:18.212 --> 00:19:19.318 circuits are functioning, right.
NOTE Confidence: 0.966243938571428
00:19:19.318 --> 00:19:21.226 So there have been a number
NOTE Confidence: 0.966243938571428
00:19:21.226 --> 00:19:22.607 of genetically encoded voltage
NOTE Confidence: 0.966243938571428
00:19:22.607 --> 00:19:24.785 sensors out there and also some
NOTE Confidence: 0.966243938571428
00:19:24.785 --> 00:19:25.874 chemical voltage sensors,
NOTE Confidence: 0.966243938571428
00:19:25.880 --> 00:19:27.032 but they've they've suffered
NOTE Confidence: 0.966243938571428
00:19:27.032 --> 00:19:28.760 from a couple of key things.
NOTE Confidence: 0.966243938571428
00:19:28.760 --> 00:19:31.510 One is that you don't,
NOTE Confidence: 0.966243938571428
00:19:31.510 --> 00:19:32.875 you don't get a very high signal,
NOTE Confidence: 0.966243938571428
00:19:32.880 --> 00:19:35.760 so you really have to put a lot of energy,
NOTE Confidence: 0.966243938571428

00:19:35.760 --> 00:19:38.320 a lot of light energy into the cells,
NOTE Confidence: 0.966243938571428

00:19:38.320 --> 00:19:40.222 into your tissue in order to
NOTE Confidence: 0.966243938571428

00:19:40.222 --> 00:19:41.800 get a reasonable signal out.
NOTE Confidence: 0.966243938571428

00:19:41.800 --> 00:19:43.592 So this is a problem in terms
NOTE Confidence: 0.966243938571428

00:19:43.592 --> 00:19:44.360 of tissue damage.
NOTE Confidence: 0.966243938571428

00:19:44.360 --> 00:19:46.640 Another is that up until recently,
NOTE Confidence: 0.966243938571428

00:19:46.640 --> 00:19:47.681 all these probes,
NOTE Confidence: 0.966243938571428

00:19:47.681 --> 00:19:49.416 they'd respond to changes in
NOTE Confidence: 0.966243938571428

00:19:49.416 --> 00:19:51.591 voltage into to depolarizations by
NOTE Confidence: 0.966243938571428

00:19:51.591 --> 00:19:53.475 decreasing their signal intensity,
NOTE Confidence: 0.966243938571428

00:19:53.480 --> 00:19:54.818 decreasing the fluorescence.
NOTE Confidence: 0.966243938571428

00:19:54.818 --> 00:19:57.494 So I think you can imagine
NOTE Confidence: 0.966243938571428

00:19:57.494 --> 00:19:59.820 intuitively that this this is becomes
NOTE Confidence: 0.966243938571428

00:19:59.820 --> 00:20:01.360 problematic for small changes.
NOTE Confidence: 0.966243938571428

00:20:01.360 --> 00:20:02.632 You're looking at a decrease in
NOTE Confidence: 0.966243938571428

00:20:02.632 --> 00:20:04.131 signal so you get into problems

NOTE Confidence: 0.966243938571428

00:20:04.131 --> 00:20:05.040 with Singleton noise.

NOTE Confidence: 0.966243938571428

00:20:05.040 --> 00:20:07.044 So sensitivity and you really want

NOTE Confidence: 0.966243938571428

00:20:07.044 --> 00:20:09.266 sensitivity is an issue to be solved

NOTE Confidence: 0.966243938571428

00:20:09.266 --> 00:20:11.177 and you also would rather have what

NOTE Confidence: 0.966243938571428

00:20:11.177 --> 00:20:12.719 we call a positive going sensor.

NOTE Confidence: 0.854098386

00:20:12.720 --> 00:20:14.640 So here are the really cool

NOTE Confidence: 0.854098386

00:20:14.640 --> 00:20:15.920 developments along these lines.

NOTE Confidence: 0.854098386

00:20:15.920 --> 00:20:19.560 So the Pure Bone and Chen groups.

NOTE Confidence: 0.854098386

00:20:19.560 --> 00:20:21.792 Developed a new spike detection through

NOTE Confidence: 0.854098386

00:20:21.792 --> 00:20:23.760 these so-called positive going sensors.

NOTE Confidence: 0.854098386

00:20:23.760 --> 00:20:26.060 These ASAP generally encoded

NOTE Confidence: 0.854098386

00:20:26.060 --> 00:20:28.360 voltage indicators called spiky,

NOTE Confidence: 0.854098386

00:20:28.360 --> 00:20:31.048 spiky and spiky 2 and they've also

NOTE Confidence: 0.854098386

00:20:31.048 --> 00:20:33.160 in parallel developed so that's the

NOTE Confidence: 0.854098386

00:20:33.160 --> 00:20:36.358 the chemistry of the actual sensor.

NOTE Confidence: 0.854098386

00:20:36.360 --> 00:20:38.268 But they've also developed low power
NOTE Confidence: 0.854098386

00:20:38.268 --> 00:20:39.901 two photon imaging that actually
NOTE Confidence: 0.854098386

00:20:39.901 --> 00:20:41.743 allows them to detect the smaller
NOTE Confidence: 0.854098386

00:20:41.743 --> 00:20:44.098 signals and you can see here on the
NOTE Confidence: 0.854098386

00:20:44.098 --> 00:20:45.473 right these little spike signals
NOTE Confidence: 0.854098386

00:20:45.480 --> 00:20:47.776 that they can detect this way in
NOTE Confidence: 0.854098386

00:20:47.776 --> 00:20:49.520 response to changes of voltage.
NOTE Confidence: 0.854098386

00:20:49.520 --> 00:20:52.250 So Michael Lynn's team who developed
NOTE Confidence: 0.854098386

00:20:52.250 --> 00:20:54.552 the so-called who developed the
NOTE Confidence: 0.854098386

00:20:54.552 --> 00:20:56.593 original ASAP sensors also developed
NOTE Confidence: 0.854098386

00:20:56.593 --> 00:20:58.648 these ultra fast sensors that
NOTE Confidence: 0.854098386

00:20:58.648 --> 00:21:00.918 now are also positive going.
NOTE Confidence: 0.854098386

00:21:00.920 --> 00:21:03.753 The upper trace here shows responses
NOTE Confidence: 0.854098386

00:21:03.753 --> 00:21:07.732 of the cell to to to calcium these
NOTE Confidence: 0.854098386

00:21:07.732 --> 00:21:10.560 you can see these fairly slow slow
NOTE Confidence: 0.854098386

00:21:10.643 --> 00:21:12.352 wave forms that in relation to the

NOTE Confidence: 0.854098386

00:21:12.352 --> 00:21:14.147 bottom where you can see the actual

NOTE Confidence: 0.854098386

00:21:14.147 --> 00:21:15.785 spiking of the cells really quite

NOTE Confidence: 0.854098386

00:21:15.785 --> 00:21:17.317 remarkable and it's it's sustainable.

NOTE Confidence: 0.854098386

00:21:17.320 --> 00:21:19.830 So the this gets to the issue of not frying

NOTE Confidence: 0.854098386

00:21:19.897 --> 00:21:22.235 the cell before your experiment is over.

NOTE Confidence: 0.854098386

00:21:22.240 --> 00:21:22.648 OK.

NOTE Confidence: 0.854098386

00:21:22.648 --> 00:21:25.504 And then finally Adam Collins Group utilized

NOTE Confidence: 0.854098386

00:21:25.504 --> 00:21:28.344 a novel screening strategy to identify

NOTE Confidence: 0.854098386

00:21:28.344 --> 00:21:30.481 these new archaeohodopsin based sensors.

NOTE Confidence: 0.854098386

00:21:30.481 --> 00:21:33.190 And here you can see two cells

NOTE Confidence: 0.854098386

00:21:33.254 --> 00:21:35.154 in a preparation that are

NOTE Confidence: 0.854098386

00:21:35.154 --> 00:21:36.674 that are electric connected,

NOTE Confidence: 0.854098386

00:21:36.680 --> 00:21:38.198 you can see them spiking together.

NOTE Confidence: 0.854098386

00:21:38.200 --> 00:21:40.920 So this now can be applied more broadly.

NOTE Confidence: 0.854098386

00:21:40.920 --> 00:21:43.510 These three types of new Gabbys can

NOTE Confidence: 0.854098386

00:21:43.510 --> 00:21:45.998 be applied more broadly to look at
NOTE Confidence: 0.854098386

00:21:46.000 --> 00:21:49.840 activity patterns across areas in vivo,
NOTE Confidence: 0.854098386

00:21:49.840 --> 00:21:52.360 so really to push the boundaries
NOTE Confidence: 0.854098386

00:21:52.360 --> 00:21:54.541 of understanding the function in
NOTE Confidence: 0.854098386

00:21:54.541 --> 00:21:57.719 neural circuits. So one example.
NOTE Confidence: 0.854098386

00:21:57.720 --> 00:21:59.554 So another example I'm showing you here
NOTE Confidence: 0.854098386

00:21:59.554 --> 00:22:01.573 is from Lynn Tian's lab at UC Davis
NOTE Confidence: 0.854098386

00:22:01.573 --> 00:22:03.532 and now she's about about to or just
NOTE Confidence: 0.854098386

00:22:03.532 --> 00:22:05.560 moved to the Mount Splunk in Florida.
NOTE Confidence: 0.854098386

00:22:05.560 --> 00:22:07.037 So the back story of this is,
NOTE Confidence: 0.854098386

00:22:07.040 --> 00:22:09.000 if we look at drugs used to treat,
NOTE Confidence: 0.854098386

00:22:09.000 --> 00:22:10.353 for example, depression,
NOTE Confidence: 0.854098386

00:22:10.353 --> 00:22:12.157 it's been about 5.
NOTE Confidence: 0.854098386

00:22:12.160 --> 00:22:14.799 It's been literally 5 decades since the
NOTE Confidence: 0.854098386

00:22:14.799 --> 00:22:16.559 introduction of philosophy or Prozac.
NOTE Confidence: 0.854098386

00:22:16.560 --> 00:22:18.639 And since then there hasn't been a

NOTE Confidence: 0.854098386

00:22:18.639 --> 00:22:21.730 whole lot done in terms of finding new

NOTE Confidence: 0.854098386

00:22:21.730 --> 00:22:23.983 classes of antidepressants until recently

NOTE Confidence: 0.854098386

00:22:23.983 --> 00:22:27.079 with this research interest in psychedelics,

NOTE Confidence: 0.854098386

00:22:27.080 --> 00:22:27.435 right.

NOTE Confidence: 0.854098386

00:22:27.435 --> 00:22:28.855 And the psychedelics fall

NOTE Confidence: 0.854098386

00:22:28.855 --> 00:22:29.920 into different classes.

NOTE Confidence: 0.854098386

00:22:29.920 --> 00:22:30.688 There's the ketamine,

NOTE Confidence: 0.854098386

00:22:30.688 --> 00:22:31.200 there's ketamine,

NOTE Confidence: 0.854098386

00:22:31.200 --> 00:22:33.840 but there's also these five HT,

NOTE Confidence: 0.854098386

00:22:33.840 --> 00:22:36.080 2C serotonin receptor agonist.

NOTE Confidence: 0.854098386

00:22:36.080 --> 00:22:37.879 Now they seem to be quite promising,

NOTE Confidence: 0.854098386

00:22:37.880 --> 00:22:40.168 but of course one of the issues is

NOTE Confidence: 0.854098386

00:22:40.168 --> 00:22:42.478 the side effect of hallucinations.

NOTE Confidence: 0.854098386

00:22:42.480 --> 00:22:45.147 So what Linton's lab has done is

NOTE Confidence: 0.854098386

00:22:45.147 --> 00:22:46.896 they've developed this biosensor

NOTE Confidence: 0.854098386

00:22:46.896 --> 00:22:48.479 for serotonin based on the
NOTE Confidence: 0.679806798333333
00:22:50.640 --> 00:22:52.518 55 HT 2A2A. Sorry about that.
NOTE Confidence: 0.679806798333333
00:22:52.520 --> 00:22:55.360 Did I say 2C? And I meant 2A,
NOTE Confidence: 0.679806798333333
00:22:55.360 --> 00:22:57.660 which actually it gives different
NOTE Confidence: 0.679806798333333
00:22:57.660 --> 00:22:59.500 readouts based on conformational
NOTE Confidence: 0.679806798333333
00:22:59.500 --> 00:23:01.790 changes and they can deliver this
NOTE Confidence: 0.679806798333333
00:23:01.790 --> 00:23:05.544 into a mouse using AAV techniques to
NOTE Confidence: 0.679806798333333
00:23:05.544 --> 00:23:10.440 look at to monitor 5 HT release and
NOTE Confidence: 0.679806798333333
00:23:10.440 --> 00:23:12.920 expression and what was really cool here.
NOTE Confidence: 0.679806798333333
00:23:12.920 --> 00:23:15.720 Using Cyclite in a vivo screening platform,
NOTE Confidence: 0.679806798333333
00:23:15.720 --> 00:23:19.430 they could identify various 5 HT 2A
NOTE Confidence: 0.679806798333333
00:23:19.430 --> 00:23:21.570 agonist and actually parse them out
NOTE Confidence: 0.679806798333333
00:23:21.570 --> 00:23:23.627 depending on whether they might or
NOTE Confidence: 0.679806798333333
00:23:23.627 --> 00:23:25.159 might not have hallucinogenetic,
NOTE Confidence: 0.679806798333333
00:23:25.160 --> 00:23:26.780 hallucinogenic activity and actually
NOTE Confidence: 0.679806798333333
00:23:26.780 --> 00:23:29.583 use this potentially as a screen for

NOTE Confidence: 0.679806798333333
00:23:29.583 --> 00:23:31.138 identifying new drugs that could
NOTE Confidence: 0.679806798333333
00:23:31.138 --> 00:23:33.300 be used to treat depression but
NOTE Confidence: 0.679806798333333
00:23:33.300 --> 00:23:35.440 without these unwanted side effects.
NOTE Confidence: 0.679806798333333
00:23:35.440 --> 00:23:36.872 So this is just and there's a lot
NOTE Confidence: 0.679806798333333
00:23:36.872 --> 00:23:38.280 of work going on in this space,
NOTE Confidence: 0.679806798333333
00:23:38.280 --> 00:23:41.600 but it's just showing you the idea
NOTE Confidence: 0.679806798333333
00:23:41.600 --> 00:23:43.600 that with these new techniques,
NOTE Confidence: 0.679806798333333
00:23:43.600 --> 00:23:44.872 these new technologies,
NOTE Confidence: 0.679806798333333
00:23:44.872 --> 00:23:45.720 screening technologies,
NOTE Confidence: 0.679806798333333
00:23:45.720 --> 00:23:47.824 we might have a way of getting at
NOTE Confidence: 0.679806798333333
00:23:47.824 --> 00:23:50.137 a new class of therapeutics in
NOTE Confidence: 0.679806798333333
00:23:50.137 --> 00:23:52.277 the in the pharmacologic domain.
NOTE Confidence: 0.679806798333333
00:23:52.280 --> 00:23:55.204 OK. So the third key,
NOTE Confidence: 0.679806798333333
00:23:55.204 --> 00:23:57.326 key take away I'd like to leave you
NOTE Confidence: 0.679806798333333
00:23:57.326 --> 00:23:59.526 with is that we're creating a new way
NOTE Confidence: 0.679806798333333

00:23:59.587 --> 00:24:01.739 of doing science that I think will is
NOTE Confidence: 0.679806798333333

00:24:01.739 --> 00:24:05.000 and will accelerate the pace of discovery.
NOTE Confidence: 0.679806798333333

00:24:05.000 --> 00:24:06.500 So in 2022, we launched what
NOTE Confidence: 0.679806798333333

00:24:06.500 --> 00:24:08.160 we call the BRAIN initiative,
NOTE Confidence: 0.679806798333333

00:24:08.160 --> 00:24:09.016 transformative projects,
NOTE Confidence: 0.679806798333333

00:24:09.016 --> 00:24:11.156 kind of a bold statement.
NOTE Confidence: 0.679806798333333

00:24:11.160 --> 00:24:13.036 And the idea here is that in
NOTE Confidence: 0.679806798333333

00:24:13.036 --> 00:24:14.774 order to fully understand how
NOTE Confidence: 0.679806798333333

00:24:14.774 --> 00:24:16.518 Brain Circus actually work,
NOTE Confidence: 0.679806798333333

00:24:16.520 --> 00:24:18.800 we need ground truth information
NOTE Confidence: 0.679806798333333

00:24:18.800 --> 00:24:20.372 about the cell types and the
NOTE Confidence: 0.679806798333333

00:24:20.372 --> 00:24:21.999 connections they make with each other,
NOTE Confidence: 0.679806798333333

00:24:22.000 --> 00:24:24.232 and also a way of interrogating
NOTE Confidence: 0.679806798333333

00:24:24.232 --> 00:24:25.720 this information to test,
NOTE Confidence: 0.679806798333333

00:24:25.720 --> 00:24:28.793 to develop and test hypothesis about their
NOTE Confidence: 0.679806798333333

00:24:28.793 --> 00:24:31.480 roles in different types of behavior.

NOTE Confidence: 0.679806798333333
00:24:31.480 --> 00:24:32.754 So the first project I'll tell you
NOTE Confidence: 0.679806798333333
00:24:32.754 --> 00:24:33.999 about is the Brain Initiative,
NOTE Confidence: 0.679806798333333
00:24:34.000 --> 00:24:35.600 Cell Atlas Network or Bican.
NOTE Confidence: 0.679806798333333
00:24:35.600 --> 00:24:38.036 And the goal here is to map,
NOTE Confidence: 0.679806798333333
00:24:38.040 --> 00:24:40.272 map out all the brain cell types and
NOTE Confidence: 0.679806798333333
00:24:40.272 --> 00:24:41.799 circuits across multiple species,
NOTE Confidence: 0.679806798333333
00:24:41.800 --> 00:24:43.120 with an emphasis on big brands,
NOTE Confidence: 0.679806798333333
00:24:43.120 --> 00:24:45.280 particularly in humans.
NOTE Confidence: 0.679806798333333
00:24:45.280 --> 00:24:47.240 So that's the parts list.
NOTE Confidence: 0.679806798333333
00:24:47.240 --> 00:24:48.632 The second is the wiring diagram
NOTE Confidence: 0.679806798333333
00:24:48.632 --> 00:24:50.097 and we just launched this what
NOTE Confidence: 0.679806798333333
00:24:50.097 --> 00:24:51.317 we call the BRAIN initiative,
NOTE Confidence: 0.679806798333333
00:24:51.320 --> 00:24:52.940 connectivity across scales or
NOTE Confidence: 0.679806798333333
00:24:52.940 --> 00:24:54.155 brain Connects program,
NOTE Confidence: 0.679806798333333
00:24:54.160 --> 00:24:56.290 which will provide the tools that
NOTE Confidence: 0.679806798333333

00:24:56.290 --> 00:24:58.605 we'll need to develop a wiring
NOTE Confidence: 0.679806798333333
00:24:58.605 --> 00:25:00.680 diagram for entire mammalian brains,
NOTE Confidence: 0.679806798333333
00:25:00.680 --> 00:25:01.672 whole brains.
NOTE Confidence: 0.679806798333333
00:25:01.672 --> 00:25:03.160 And then finally,
NOTE Confidence: 0.679806798333333
00:25:03.160 --> 00:25:04.792 we're developing an armamentarium
NOTE Confidence: 0.679806798333333
00:25:04.792 --> 00:25:07.512 or just a big toolkit for precision
NOTE Confidence: 0.679806798333333
00:25:07.512 --> 00:25:08.520 brain cell access,
NOTE Confidence: 0.679806798333333
00:25:08.520 --> 00:25:10.230 which will leverage the information
NOTE Confidence: 0.679806798333333
00:25:10.230 --> 00:25:12.342 coming from the other two big
NOTE Confidence: 0.679806798333333
00:25:12.342 --> 00:25:14.596 projects to allow researchers to
NOTE Confidence: 0.679806798333333
00:25:14.596 --> 00:25:17.470 test hypothesis about the roles of
NOTE Confidence: 0.679806798333333
00:25:17.554 --> 00:25:20.384 specific cell types and circuits
NOTE Confidence: 0.679806798333333
00:25:20.384 --> 00:25:22.280 in underpinning behavior both
NOTE Confidence: 0.679806798333333
00:25:22.280 --> 00:25:23.800 in health and disease.
NOTE Confidence: 0.679806798333333
00:25:23.800 --> 00:25:24.392 And ultimately,
NOTE Confidence: 0.679806798333333
00:25:24.392 --> 00:25:26.464 I see these three projects working in

NOTE Confidence: 0.679806798333333
00:25:26.464 --> 00:25:28.510 a mutually reinforcing way that will
NOTE Confidence: 0.679806798333333
00:25:28.510 --> 00:25:30.800 lead us to precision circuit therapies.
NOTE Confidence: 0.679806798333333
00:25:30.800 --> 00:25:32.896 And I think the blue sky scenario in
NOTE Confidence: 0.679806798333333
00:25:32.896 --> 00:25:35.204 my mind is developing precision gene
NOTE Confidence: 0.679806798333333
00:25:35.204 --> 00:25:37.354 therapies for human brain disorders.
NOTE Confidence: 0.679806798333333
00:25:37.360 --> 00:25:38.568 So a tall order,
NOTE Confidence: 0.679806798333333
00:25:38.568 --> 00:25:41.488 but I I hope to to share with you
NOTE Confidence: 0.679806798333333
00:25:41.488 --> 00:25:43.175 some evidence that I think we're
NOTE Confidence: 0.679806798333333
00:25:43.175 --> 00:25:44.880 going along on the right track.
NOTE Confidence: 0.679806798333333
00:25:44.880 --> 00:25:45.386 OK.
NOTE Confidence: 0.679806798333333
00:25:45.386 --> 00:25:48.422 So let's start with the cell
NOTE Confidence: 0.679806798333333
00:25:48.422 --> 00:25:49.434 atlasing project.
NOTE Confidence: 0.679806798333333
00:25:49.440 --> 00:25:51.519 This effort actually started back in 2014.
NOTE Confidence: 0.679806798333333
00:25:51.520 --> 00:25:53.368 It was one of the first
NOTE Confidence: 0.679806798333333
00:25:53.368 --> 00:25:54.600 programs launched by the
NOTE Confidence: 0.822648167142857

00:25:54.672 --> 00:25:56.280 BRAIN initiative in 2014.
NOTE Confidence: 0.822648167142857

00:25:56.280 --> 00:25:57.565 I was actually a member
NOTE Confidence: 0.822648167142857

00:25:57.565 --> 00:25:58.593 of this BRAIN initiative,
NOTE Confidence: 0.822648167142857

00:25:58.600 --> 00:26:00.104 Cell Sensors Consortium and
NOTE Confidence: 0.822648167142857

00:26:00.104 --> 00:26:02.360 here the idea was to identify,
NOTE Confidence: 0.822648167142857

00:26:02.360 --> 00:26:05.276 validate scalable technologies that
NOTE Confidence: 0.822648167142857

00:26:05.276 --> 00:26:08.222 could be used to create an inventory of
NOTE Confidence: 0.822648167142857

00:26:08.222 --> 00:26:10.478 all the cell types in a mammalian brain.
NOTE Confidence: 0.822648167142857

00:26:10.480 --> 00:26:13.198 So that was back in 2014.
NOTE Confidence: 0.822648167142857

00:26:13.200 --> 00:26:16.620 It was rapidly scaled up in 2017 into
NOTE Confidence: 0.822648167142857

00:26:16.620 --> 00:26:19.000 a larger group known as the BRAIN
NOTE Confidence: 0.822648167142857

00:26:19.000 --> 00:26:20.760 Initiative Cell Sensors Network.
NOTE Confidence: 0.822648167142857

00:26:20.760 --> 00:26:24.078 And here the idea was to actually
NOTE Confidence: 0.822648167142857

00:26:24.078 --> 00:26:26.933 implement these tools to no small order,
NOTE Confidence: 0.822648167142857

00:26:26.933 --> 00:26:28.888 no small order to revolutionize
NOTE Confidence: 0.822648167142857

00:26:28.888 --> 00:26:31.226 our ability to classify brain cell

NOTE Confidence: 0.822648167142857

00:26:31.226 --> 00:26:33.622 types based on a multimodal or an

NOTE Confidence: 0.822648167142857

00:26:33.622 --> 00:26:35.640 integrated analysis of their molecular,

NOTE Confidence: 0.822648167142857

00:26:35.640 --> 00:26:36.904 anatomical and physiological property.

NOTE Confidence: 0.822648167142857

00:26:36.904 --> 00:26:38.800 So not just looking at transcriptomics,

NOTE Confidence: 0.822648167142857

00:26:38.800 --> 00:26:40.780 but really getting a full picture

NOTE Confidence: 0.822648167142857

00:26:40.780 --> 00:26:42.760 of what constitutes a cell type.

NOTE Confidence: 0.822648167142857

00:26:42.760 --> 00:26:44.314 So this program meant for five years,

NOTE Confidence: 0.822648167142857

00:26:44.320 --> 00:26:46.678 we're just kind of wrapping it up right now.

NOTE Confidence: 0.822648167142857

00:26:46.680 --> 00:26:49.040 And it serves as a basis for BICAN,

NOTE Confidence: 0.822648167142857

00:26:49.040 --> 00:26:50.600 the BRAIN Initiative, Cell Atlas Network,

NOTE Confidence: 0.822648167142857

00:26:50.600 --> 00:26:53.408 which now is placing our emphasis

NOTE Confidence: 0.822648167142857

00:26:53.408 --> 00:26:55.280 on the human brain.

NOTE Confidence: 0.822648167142857

00:26:55.280 --> 00:26:55.535 OK.

NOTE Confidence: 0.822648167142857

00:26:55.535 --> 00:26:57.830 So let me just go over with you what

NOTE Confidence: 0.822648167142857

00:26:57.895 --> 00:27:00.195 we've accomplished with the BRAIN

NOTE Confidence: 0.822648167142857

00:27:00.195 --> 00:27:02.035 Initiative Cell Senses Network.
NOTE Confidence: 0.822648167142857

00:27:02.040 --> 00:27:07.480 It started out with the BICCC and the BICCN.
NOTE Confidence: 0.822648167142857

00:27:07.480 --> 00:27:09.358 In October of 2021,
NOTE Confidence: 0.822648167142857

00:27:09.358 --> 00:27:11.584 the group and I was still involved
NOTE Confidence: 0.822648167142857

00:27:11.584 --> 00:27:13.612 with this group published 17 papers
NOTE Confidence: 0.822648167142857

00:27:13.612 --> 00:27:16.386 in Nature and 10 papers in Nature's
NOTE Confidence: 0.822648167142857

00:27:16.386 --> 00:27:19.343 sister journals characterizing the cell
NOTE Confidence: 0.822648167142857

00:27:19.343 --> 00:27:23.040 types in the primary motor cortex of mice,
NOTE Confidence: 0.822648167142857

00:27:23.040 --> 00:27:24.800 non human primates in humans.
NOTE Confidence: 0.822648167142857

00:27:24.800 --> 00:27:27.040 This was started out as a pilot project.
NOTE Confidence: 0.822648167142857

00:27:27.040 --> 00:27:28.867 It's kind of hysterical as a small
NOTE Confidence: 0.822648167142857

00:27:28.867 --> 00:27:30.609 project just to make sure we could
NOTE Confidence: 0.822648167142857

00:27:30.609 --> 00:27:32.610 all kind of come up with a common
NOTE Confidence: 0.822648167142857

00:27:32.610 --> 00:27:34.560 picture across this very large group
NOTE Confidence: 0.822648167142857

00:27:34.560 --> 00:27:36.520 that can integrate information
NOTE Confidence: 0.822648167142857

00:27:36.520 --> 00:27:38.480 across these different techniques.

NOTE Confidence: 0.822648167142857
00:27:38.480 --> 00:27:39.920 It wasn't a given that you could do it.
NOTE Confidence: 0.822648167142857
00:27:39.920 --> 00:27:40.498 In fact,
NOTE Confidence: 0.822648167142857
00:27:40.498 --> 00:27:42.232 many of the techniques to integrate
NOTE Confidence: 0.822648167142857
00:27:42.232 --> 00:27:43.833 the information were were developed
NOTE Confidence: 0.822648167142857
00:27:43.833 --> 00:27:46.000 through this project just published 2
NOTE Confidence: 0.822648167142857
00:27:46.000 --> 00:27:49.460 days ago or were series of 10 papers in
NOTE Confidence: 0.822648167142857
00:27:49.460 --> 00:27:51.920 nature characterizing the entire mouse brain.
NOTE Confidence: 0.822648167142857
00:27:51.920 --> 00:27:53.882 And I'll go over that with you in a
NOTE Confidence: 0.822648167142857
00:27:53.882 --> 00:27:55.680 moment really I think a monumental effort
NOTE Confidence: 0.822648167142857
00:27:55.680 --> 00:27:58.160 and a really a landmark series of studies.
NOTE Confidence: 0.822648167142857
00:27:58.160 --> 00:28:00.888 And then just back in October the BICCN
NOTE Confidence: 0.822648167142857
00:28:00.888 --> 00:28:03.192 non human primate and human groups
NOTE Confidence: 0.822648167142857
00:28:03.192 --> 00:28:05.536 published 21 papers and three science
NOTE Confidence: 0.822648167142857
00:28:05.536 --> 00:28:08.583 journals giving us a draft cell Atlas of
NOTE Confidence: 0.822648167142857
00:28:08.583 --> 00:28:11.439 the human brain and non human primate brain.
NOTE Confidence: 0.822648167142857

00:28:11.440 --> 00:28:13.402 So let me just go through
NOTE Confidence: 0.822648167142857

00:28:13.402 --> 00:28:15.439 with these with you in order.
NOTE Confidence: 0.822648167142857

00:28:15.440 --> 00:28:17.300 So the the primary motor cortex
NOTE Confidence: 0.822648167142857

00:28:17.300 --> 00:28:19.848 paper gave us a multimodal census and
NOTE Confidence: 0.822648167142857

00:28:19.848 --> 00:28:22.314 Atlas of the primary motor cortex.
NOTE Confidence: 0.822648167142857

00:28:22.320 --> 00:28:23.080 As I as I said,
NOTE Confidence: 0.822648167142857

00:28:23.080 --> 00:28:24.268 across 33 species,
NOTE Confidence: 0.822648167142857

00:28:24.268 --> 00:28:27.760 it really was a triumph of team science.
NOTE Confidence: 0.822648167142857

00:28:27.760 --> 00:28:29.632 This really hadn't been done before
NOTE Confidence: 0.822648167142857

00:28:29.632 --> 00:28:30.880 neuroscience to my knowledge.
NOTE Confidence: 0.822648167142857

00:28:30.880 --> 00:28:34.344 There were over 250 of us from over
NOTE Confidence: 0.822648167142857

00:28:34.344 --> 00:28:36.998 45 institutions across 3 continents.
NOTE Confidence: 0.822648167142857

00:28:37.000 --> 00:28:38.278 It wasn't easy in the beginning,
NOTE Confidence: 0.822648167142857

00:28:38.280 --> 00:28:40.200 but we learned how to work
NOTE Confidence: 0.822648167142857

00:28:40.200 --> 00:28:40.840 together collaboratively.
NOTE Confidence: 0.822648167142857

00:28:40.840 --> 00:28:42.359 A lot of great science was done.

NOTE Confidence: 0.822648167142857
00:28:42.360 --> 00:28:44.430 A lot of junior faculty careers
NOTE Confidence: 0.822648167142857
00:28:44.430 --> 00:28:46.280 were launched through these efforts
NOTE Confidence: 0.822648167142857
00:28:46.280 --> 00:28:48.100 and it's really set the stage for
NOTE Confidence: 0.822648167142857
00:28:48.100 --> 00:28:49.525 the larger and more comprehensive
NOTE Confidence: 0.822648167142857
00:28:49.525 --> 00:28:51.869 atlases of both mice as well as the
NOTE Confidence: 0.924515366818182
00:28:51.923 --> 00:28:52.519 big brains.
NOTE Confidence: 0.892296082352941
00:28:55.040 --> 00:28:57.966 So again, just published 2 days ago
NOTE Confidence: 0.892296082352941
00:28:57.966 --> 00:29:01.254 this huge effort to map the entire mouse
NOTE Confidence: 0.892296082352941
00:29:01.254 --> 00:29:04.456 brain over 32,000,000 cells were analyzed
NOTE Confidence: 0.892296082352941
00:29:04.456 --> 00:29:08.080 here with a variety of techniques.
NOTE Confidence: 0.892296082352941
00:29:08.080 --> 00:29:10.411 The group came up with over 5000
NOTE Confidence: 0.892296082352941
00:29:10.411 --> 00:29:12.839 neuronal and non neuronal cell types
NOTE Confidence: 0.892296082352941
00:29:12.839 --> 00:29:15.157 that were identified and it really
NOTE Confidence: 0.892296082352941
00:29:15.157 --> 00:29:17.071 started giving us insights into the
NOTE Confidence: 0.892296082352941
00:29:17.071 --> 00:29:18.472 organizational principles underlying the
NOTE Confidence: 0.892296082352941

00:29:18.472 --> 00:29:20.880 diversification of cell types in the brain.
NOTE Confidence: 0.892296082352941

00:29:20.880 --> 00:29:22.518 Let me just go through this with you very,
NOTE Confidence: 0.892296082352941

00:29:22.520 --> 00:29:23.170 very quickly.
NOTE Confidence: 0.892296082352941

00:29:23.170 --> 00:29:25.445 So the bedrock of all these studies
NOTE Confidence: 0.892296082352941

00:29:25.445 --> 00:29:27.120 has been transcriptomics.
NOTE Confidence: 0.892296082352941

00:29:27.120 --> 00:29:28.852 So single cell transcriptomics
NOTE Confidence: 0.892296082352941

00:29:28.852 --> 00:29:31.451 identified over 5000 clusters that
NOTE Confidence: 0.892296082352941

00:29:31.451 --> 00:29:33.759 one could identify statistically.
NOTE Confidence: 0.892296082352941

00:29:33.760 --> 00:29:35.308 What was really cool was throughout
NOTE Confidence: 0.892296082352941

00:29:35.308 --> 00:29:37.120 this effort there was this revolution,
NOTE Confidence: 0.892296082352941

00:29:37.120 --> 00:29:38.920 mini revolution in spatial
NOTE Confidence: 0.892296082352941

00:29:38.920 --> 00:29:41.226 transcriptomics that was a what?
NOTE Confidence: 0.892296082352941

00:29:41.226 --> 00:29:43.756 That allowed researchers to actually
NOTE Confidence: 0.892296082352941

00:29:43.760 --> 00:29:46.208 ask whether a cell type identified
NOTE Confidence: 0.892296082352941

00:29:46.208 --> 00:29:47.840 by transcriptomics could actually,
NOTE Confidence: 0.892296082352941

00:29:47.840 --> 00:29:49.295 did it actually exist distinct

NOTE Confidence: 0.892296082352941
00:29:49.295 --> 00:29:51.080 from say a cluster next door?
NOTE Confidence: 0.892296082352941
00:29:51.080 --> 00:29:52.000 And the answer is yes,
NOTE Confidence: 0.892296082352941
00:29:52.000 --> 00:29:54.317 in many cases we could the the,
NOTE Confidence: 0.892296082352941
00:29:54.320 --> 00:29:56.705 the group could see distinct
NOTE Confidence: 0.892296082352941
00:29:56.705 --> 00:29:59.090 spatially restricted cell types that
NOTE Confidence: 0.892296082352941
00:29:59.170 --> 00:30:01.985 corresponded to what was identified
NOTE Confidence: 0.892296082352941
00:30:01.985 --> 00:30:04.237 with single cell transcriptomics.
NOTE Confidence: 0.892296082352941
00:30:04.240 --> 00:30:07.190 So really really quite remarkable and very,
NOTE Confidence: 0.892296082352941
00:30:07.190 --> 00:30:08.610 very importantly the group
NOTE Confidence: 0.892296082352941
00:30:08.610 --> 00:30:09.675 used this information,
NOTE Confidence: 0.892296082352941
00:30:09.680 --> 00:30:11.580 this information plus epigenomic profiling
NOTE Confidence: 0.892296082352941
00:30:11.580 --> 00:30:14.206 to really look at the regulation of
NOTE Confidence: 0.892296082352941
00:30:14.206 --> 00:30:16.516 what actually gives you a cell type.
NOTE Confidence: 0.892296082352941
00:30:16.520 --> 00:30:18.410 And what they showed was that one
NOTE Confidence: 0.892296082352941
00:30:18.410 --> 00:30:19.880 could classify these cell types
NOTE Confidence: 0.892296082352941

00:30:19.880 --> 00:30:21.686 pretty well based just based on
NOTE Confidence: 0.892296082352941

00:30:21.686 --> 00:30:23.040 the transcription factors alone.
NOTE Confidence: 0.892296082352941

00:30:23.040 --> 00:30:25.146 And that together with the epigenetic
NOTE Confidence: 0.892296082352941

00:30:25.146 --> 00:30:27.535 profile really started giving us an idea
NOTE Confidence: 0.892296082352941

00:30:27.535 --> 00:30:29.075 of what what happens developmentally
NOTE Confidence: 0.892296082352941

00:30:29.080 --> 00:30:31.204 as well as over aging as well as evil
NOTE Confidence: 0.892296082352941

00:30:31.204 --> 00:30:33.037 and evolutionary terms in terms of
NOTE Confidence: 0.892296082352941

00:30:33.037 --> 00:30:35.320 what makes a cell type A cell type.
NOTE Confidence: 0.892296082352941

00:30:35.320 --> 00:30:36.520 So this is really quite,
NOTE Confidence: 0.892296082352941

00:30:36.520 --> 00:30:37.384 quite beautiful work.
NOTE Confidence: 0.892296082352941

00:30:37.384 --> 00:30:39.400 It gives us a basis now for
NOTE Confidence: 0.892296082352941

00:30:39.464 --> 00:30:41.172 functionalizing this information to
NOTE Confidence: 0.892296082352941

00:30:41.172 --> 00:30:43.726 really get deeper into what how you
NOTE Confidence: 0.892296082352941

00:30:43.726 --> 00:30:45.418 construct A neural circuit but also
NOTE Confidence: 0.892296082352941

00:30:45.418 --> 00:30:47.437 how these neural circuits function.
NOTE Confidence: 0.892296082352941

00:30:47.440 --> 00:30:49.360 OK.

NOTE Confidence: 0.892296082352941
00:30:49.360 --> 00:30:51.817 And then back in October again these
NOTE Confidence: 0.892296082352941
00:30:51.817 --> 00:30:54.178 21 joint publications across 3 science
NOTE Confidence: 0.892296082352941
00:30:54.178 --> 00:30:55.838 family journals were published.
NOTE Confidence: 0.892296082352941
00:30:55.840 --> 00:30:58.200 Really just a draft Atlas of the human
NOTE Confidence: 0.892296082352941
00:30:58.200 --> 00:31:00.399 brain and non human primate brains.
NOTE Confidence: 0.892296082352941
00:31:00.400 --> 00:31:03.508 And this is this effort really was
NOTE Confidence: 0.892296082352941
00:31:03.508 --> 00:31:05.845 is unprecedented and it paves the way
NOTE Confidence: 0.892296082352941
00:31:05.845 --> 00:31:07.632 for a greater understanding of the
NOTE Confidence: 0.892296082352941
00:31:07.632 --> 00:31:10.080 human brain at the cellular level and
NOTE Confidence: 0.892296082352941
00:31:10.080 --> 00:31:12.480 gives us tools for understanding disease
NOTE Confidence: 0.892296082352941
00:31:12.480 --> 00:31:14.560 processes using this information.
NOTE Confidence: 0.892296082352941
00:31:14.560 --> 00:31:16.765 Let me just walk you through this
NOTE Confidence: 0.892296082352941
00:31:16.765 --> 00:31:17.395 very quickly.
NOTE Confidence: 0.892296082352941
00:31:17.400 --> 00:31:20.300 The group characterized these many
NOTE Confidence: 0.892296082352941
00:31:20.300 --> 00:31:22.480 thousands identified cell types across space,
NOTE Confidence: 0.892296082352941

00:31:22.480 --> 00:31:25.072 again using single cell techniques as
NOTE Confidence: 0.892296082352941

00:31:25.072 --> 00:31:27.610 well as spatial techniques across species.
NOTE Confidence: 0.892296082352941

00:31:27.610 --> 00:31:30.568 So their group looked at these maps,
NOTE Confidence: 0.892296082352941

00:31:30.568 --> 00:31:32.424 these inventories across different
NOTE Confidence: 0.892296082352941

00:31:32.424 --> 00:31:34.280 non human primate species.
NOTE Confidence: 0.892296082352941

00:31:34.280 --> 00:31:35.165 Not too surprisingly,
NOTE Confidence: 0.892296082352941

00:31:35.165 --> 00:31:37.230 the cell types identified on humans are
NOTE Confidence: 0.892296082352941

00:31:37.280 --> 00:31:39.359 most similar to the ones in the great apes.
NOTE Confidence: 0.892296082352941

00:31:39.360 --> 00:31:41.642 What was really cool is that the
NOTE Confidence: 0.892296082352941

00:31:41.642 --> 00:31:43.797 gene showing the highest differential
NOTE Confidence: 0.892296082352941

00:31:43.797 --> 00:31:46.005 expression between chimpanzees and
NOTE Confidence: 0.892296082352941

00:31:46.005 --> 00:31:48.324 us tended to localize in areas known
NOTE Confidence: 0.892296082352941

00:31:48.324 --> 00:31:50.784 to be in the so-called accelerated
NOTE Confidence: 0.892296082352941

00:31:50.784 --> 00:31:52.000 genomic regions,
NOTE Confidence: 0.892296082352941

00:31:52.000 --> 00:31:53.920 but also very importantly to
NOTE Confidence: 0.892296082352941

00:31:53.920 --> 00:31:55.840 encode proteins in the synapse.

NOTE Confidence: 0.892296082352941
00:31:55.840 --> 00:31:57.700 So this really started to tell
NOTE Confidence: 0.892296082352941
00:31:57.700 --> 00:31:59.803 us what makes us different from
NOTE Confidence: 0.892296082352941
00:31:59.803 --> 00:32:00.976 our nearest relatives.
NOTE Confidence: 0.892296082352941
00:32:00.976 --> 00:32:02.916 And then also across time,
NOTE Confidence: 0.92096272
00:32:02.920 --> 00:32:05.110 very importantly, looking at studies
NOTE Confidence: 0.92096272
00:32:05.110 --> 00:32:07.720 during development as well as aging
NOTE Confidence: 0.92096272
00:32:07.720 --> 00:32:09.826 and again giving us insights into
NOTE Confidence: 0.92096272
00:32:09.826 --> 00:32:12.494 what it takes to construct a neural
NOTE Confidence: 0.92096272
00:32:12.494 --> 00:32:15.480 circuit based on the cell types.
NOTE Confidence: 0.92096272
00:32:15.480 --> 00:32:17.139 OK. So this really sets the stage
NOTE Confidence: 0.92096272
00:32:17.139 --> 00:32:18.720 for this larger brain initiative,
NOTE Confidence: 0.92096272
00:32:18.720 --> 00:32:19.776 Cell Atlas Network,
NOTE Confidence: 0.92096272
00:32:19.776 --> 00:32:22.240 which now we'll actually dive in and
NOTE Confidence: 0.92096272
00:32:22.309 --> 00:32:24.685 get a deep dive into all the cell types
NOTE Confidence: 0.92096272
00:32:24.685 --> 00:32:26.829 in the human brain and also starting
NOTE Confidence: 0.92096272

00:32:26.829 --> 00:32:30.840 to look at the the variability in these
NOTE Confidence: 0.92096272

00:32:30.840 --> 00:32:33.640 parameters across multiple individuals.
NOTE Confidence: 0.92096272

00:32:33.640 --> 00:32:35.280 So our goal is not just to get
NOTE Confidence: 0.92096272

00:32:35.280 --> 00:32:36.879 information on one or a few individuals,
NOTE Confidence: 0.92096272

00:32:36.880 --> 00:32:39.673 but really to understand the basis of
NOTE Confidence: 0.92096272

00:32:39.673 --> 00:32:42.397 variation among humans at the cellular level.
NOTE Confidence: 0.92096272

00:32:42.400 --> 00:32:45.770 OK, so we've come a long way
NOTE Confidence: 0.92096272

00:32:45.770 --> 00:32:47.482 in the last number of years.
NOTE Confidence: 0.92096272

00:32:47.482 --> 00:32:49.885 And now the key to is to disseminate
NOTE Confidence: 0.92096272

00:32:49.885 --> 00:32:52.117 and democratize this information.
NOTE Confidence: 0.92096272

00:32:52.120 --> 00:32:53.120 The group is working very,
NOTE Confidence: 0.92096272

00:32:53.120 --> 00:32:55.542 very hard to develop knowledge bases that
NOTE Confidence: 0.92096272

00:32:55.542 --> 00:32:57.763 can be queried by researchers anywhere
NOTE Confidence: 0.92096272

00:32:57.763 --> 00:32:59.952 in the world who are interested in
NOTE Confidence: 0.92096272

00:32:59.952 --> 00:33:01.560 their particular cell type or circuit.
NOTE Confidence: 0.92096272

00:33:01.560 --> 00:33:03.401 And to put this in the context

NOTE Confidence: 0.92096272

00:33:03.401 --> 00:33:05.320 of a larger map or inventory.

NOTE Confidence: 0.92096272

00:33:05.320 --> 00:33:07.185 And another purpose here is

NOTE Confidence: 0.92096272

00:33:07.185 --> 00:33:08.677 to use this information,

NOTE Confidence: 0.92096272

00:33:08.680 --> 00:33:09.580 as I said,

NOTE Confidence: 0.92096272

00:33:09.580 --> 00:33:11.380 to understand the cellular basis of

NOTE Confidence: 0.92096272

00:33:11.380 --> 00:33:13.078 disease and disease progression.

NOTE Confidence: 0.92096272

00:33:13.080 --> 00:33:15.439 Already we're seeing advances in this area.

NOTE Confidence: 0.92096272

00:33:15.440 --> 00:33:18.120 This is just one figure from the Seattle

NOTE Confidence: 0.92096272

00:33:18.120 --> 00:33:19.798 Alzheimer's Disease Brain Cell Atlas.

NOTE Confidence: 0.92096272

00:33:19.800 --> 00:33:21.762 It's a group led by Ed Lean at the

NOTE Confidence: 0.92096272

00:33:21.762 --> 00:33:23.815 Allen Institute and Dirk Keane at

NOTE Confidence: 0.92096272

00:33:23.815 --> 00:33:26.245 University of Washington together as a

NOTE Confidence: 0.92096272

00:33:26.245 --> 00:33:28.520 collaboration with with Kaiser Permanente.

NOTE Confidence: 0.92096272

00:33:28.520 --> 00:33:31.032 And here they've looked at I think 90

NOTE Confidence: 0.92096272

00:33:31.032 --> 00:33:34.256 some odd human brain samples from mid,

NOTE Confidence: 0.92096272

00:33:34.256 --> 00:33:34.800 mid,
NOTE Confidence: 0.92096272

00:33:34.800 --> 00:33:38.684 temporal gyrus from patients at
NOTE Confidence: 0.92096272

00:33:38.684 --> 00:33:40.556 different stages of Alzheimer's.
NOTE Confidence: 0.92096272

00:33:40.560 --> 00:33:42.354 And what they're seeing is either
NOTE Confidence: 0.92096272

00:33:42.354 --> 00:33:43.550 under representation or over
NOTE Confidence: 0.92096272

00:33:43.599 --> 00:33:45.479 representation of different cell types.
NOTE Confidence: 0.92096272

00:33:45.480 --> 00:33:47.020 And this might start giving us some
NOTE Confidence: 0.92096272

00:33:47.020 --> 00:33:48.108 really good clues about what's
NOTE Confidence: 0.92096272

00:33:48.108 --> 00:33:49.636 going on not just at the very end
NOTE Confidence: 0.92096272

00:33:49.682 --> 00:33:51.103 stage of the disease but what what
NOTE Confidence: 0.92096272

00:33:51.103 --> 00:33:53.532 could be going on in the early
NOTE Confidence: 0.92096272

00:33:53.532 --> 00:33:56.129 stages to identify the drivers from
NOTE Confidence: 0.92096272

00:33:56.129 --> 00:33:58.103 a cell biological basis that could
NOTE Confidence: 0.92096272

00:33:58.103 --> 00:33:59.869 give us mechanistic insight about
NOTE Confidence: 0.92096272

00:33:59.869 --> 00:34:01.584 how to actually intervene with
NOTE Confidence: 0.92096272

00:34:01.584 --> 00:34:02.640 with prevention or cures.

NOTE Confidence: 0.92096272

00:34:02.640 --> 00:34:04.621 So we're just getting started on this

NOTE Confidence: 0.92096272

00:34:04.621 --> 00:34:07.361 but again the idea here is to lay the

NOTE Confidence: 0.92096272

00:34:07.361 --> 00:34:09.200 groundwork for future therapies and cures.

NOTE Confidence: 0.92096272

00:34:09.200 --> 00:34:12.014 So the second project here is how

NOTE Confidence: 0.92096272

00:34:12.014 --> 00:34:14.964 to develop tools to to give us a

NOTE Confidence: 0.92096272

00:34:14.964 --> 00:34:17.330 wiring diagram of organisms brains.

NOTE Confidence: 0.92096272

00:34:17.330 --> 00:34:20.755 Now as Biga left us,

NOTE Confidence: 0.92096272

00:34:20.760 --> 00:34:23.646 creating these human cell type atlases

NOTE Confidence: 0.92096272

00:34:23.646 --> 00:34:26.480 has been the connectivity analysis is

NOTE Confidence: 0.92096272

00:34:26.480 --> 00:34:28.237 orders of magnitude I think more complex.

NOTE Confidence: 0.92096272

00:34:28.240 --> 00:34:30.152 We don't yet have the tools to do

NOTE Confidence: 0.92096272

00:34:30.152 --> 00:34:31.850 this for home mammalian brains and

NOTE Confidence: 0.92096272

00:34:31.850 --> 00:34:34.003 one of the problems is of scale

NOTE Confidence: 0.92096272

00:34:34.003 --> 00:34:35.758 and resolution and frankly just

NOTE Confidence: 0.92096272

00:34:35.760 --> 00:34:36.900 handling all the data.

NOTE Confidence: 0.92096272

00:34:36.900 --> 00:34:39.310 So there's been a lot of work and
NOTE Confidence: 0.92096272

00:34:39.310 --> 00:34:41.522 model systems that we feel that are
NOTE Confidence: 0.92096272

00:34:41.522 --> 00:34:43.478 helping us get there step by step.
NOTE Confidence: 0.92096272

00:34:43.480 --> 00:34:46.160 So a lot has been done in the fruit fly
NOTE Confidence: 0.92096272

00:34:46.238 --> 00:34:48.718 starting with the larval connectome.
NOTE Confidence: 0.92096272

00:34:48.720 --> 00:34:50.796 Here a collaboration between various groups,
NOTE Confidence: 0.92096272

00:34:50.800 --> 00:34:51.176 Hopkins,
NOTE Confidence: 0.92096272

00:34:51.176 --> 00:34:53.808 Hughes and Cambridge has led to the
NOTE Confidence: 0.92096272

00:34:53.808 --> 00:34:56.109 generation of a full connectome for
NOTE Confidence: 0.92096272

00:34:56.109 --> 00:34:58.329 larval fly that contains just 3000
NOTE Confidence: 0.805224655185185

00:34:58.394 --> 00:35:01.117 neurons with about half a million synapses
NOTE Confidence: 0.805224655185185

00:35:01.120 --> 00:35:03.115 and they can be categorized as input,
NOTE Confidence: 0.805224655185185

00:35:03.120 --> 00:35:04.998 output or inter neurons and cluster.
NOTE Confidence: 0.805224655185185

00:35:05.000 --> 00:35:07.646 You can cluster these based based on
NOTE Confidence: 0.805224655185185

00:35:07.646 --> 00:35:09.798 their connectivity into about 93 types.
NOTE Confidence: 0.805224655185185

00:35:09.800 --> 00:35:12.760 And what was one cool insight here

NOTE Confidence: 0.805224655185185
00:35:12.760 --> 00:35:16.000 is that they could they identified
NOTE Confidence: 0.805224655185185
00:35:16.000 --> 00:35:19.090 connections in about 40% of the
NOTE Confidence: 0.805224655185185
00:35:19.090 --> 00:35:20.440 neurons that were were recurrent.
NOTE Confidence: 0.805224655185185
00:35:20.440 --> 00:35:22.150 And these happened in areas
NOTE Confidence: 0.805224655185185
00:35:22.150 --> 00:35:23.518 of learning and action.
NOTE Confidence: 0.805224655185185
00:35:23.520 --> 00:35:25.508 So we we hear a lot about
NOTE Confidence: 0.805224655185185
00:35:25.508 --> 00:35:26.712 recurrent neural networks that
NOTE Confidence: 0.805224655185185
00:35:26.712 --> 00:35:28.476 are being used in AI algorithms.
NOTE Confidence: 0.805224655185185
00:35:28.480 --> 00:35:29.456 Mother evolution has figured
NOTE Confidence: 0.805224655185185
00:35:29.456 --> 00:35:30.676 a lot of this out.
NOTE Confidence: 0.805224655185185
00:35:30.680 --> 00:35:32.409 We can learn a lot about how
NOTE Confidence: 0.805224655185185
00:35:32.409 --> 00:35:33.800 to develop better algorithms,
NOTE Confidence: 0.805224655185185
00:35:33.800 --> 00:35:34.816 better computers,
NOTE Confidence: 0.805224655185185
00:35:34.816 --> 00:35:37.356 based on looking at how
NOTE Confidence: 0.805224655185185
00:35:37.360 --> 00:35:38.278 neural circuits functions.
NOTE Confidence: 0.805224655185185

00:35:38.278 --> 00:35:41.048 So this is from the larval fruit fly.
NOTE Confidence: 0.805224655185185

00:35:41.048 --> 00:35:44.340 Just very recently the the whole adult
NOTE Confidence: 0.805224655185185

00:35:44.340 --> 00:35:46.618 Drosophila brain has been characterized
NOTE Confidence: 0.805224655185185

00:35:46.618 --> 00:35:48.508 the connectivity has been characterized
NOTE Confidence: 0.805224655185185

00:35:48.508 --> 00:35:50.932 by the flywire group led by Sebastian
NOTE Confidence: 0.805224655185185

00:35:50.932 --> 00:35:52.636 Son and Mala Murthy at Princeton.
NOTE Confidence: 0.805224655185185

00:35:52.640 --> 00:35:54.208 They used citizen science,
NOTE Confidence: 0.805224655185185

00:35:54.208 --> 00:35:54.600 many,
NOTE Confidence: 0.805224655185185

00:35:54.600 --> 00:35:56.400 many hundreds of researchers
NOTE Confidence: 0.805224655185185

00:35:56.400 --> 00:35:58.200 to proofread these maps.
NOTE Confidence: 0.805224655185185

00:35:58.200 --> 00:35:59.010 They've they've launched
NOTE Confidence: 0.805224655185185

00:35:59.010 --> 00:36:00.360 this out on public websites.
NOTE Confidence: 0.805224655185185

00:36:00.360 --> 00:36:01.401 Really cool stuff.
NOTE Confidence: 0.805224655185185

00:36:01.401 --> 00:36:03.483 And now maps like this allow
NOTE Confidence: 0.805224655185185

00:36:03.483 --> 00:36:04.981 researchers interested in the
NOTE Confidence: 0.805224655185185

00:36:04.981 --> 00:36:06.801 neuro circuit basis of behavior

NOTE Confidence: 0.805224655185185
00:36:06.801 --> 00:36:08.322 to formulate their hypothesis
NOTE Confidence: 0.805224655185185
00:36:08.322 --> 00:36:10.870 based on the ground truth of the
NOTE Confidence: 0.805224655185185
00:36:10.870 --> 00:36:12.448 connectivity diagrams they can do.
NOTE Confidence: 0.805224655185185
00:36:12.448 --> 00:36:13.958 You can do your experiments,
NOTE Confidence: 0.805224655185185
00:36:13.960 --> 00:36:16.592 you can go back and either falsify
NOTE Confidence: 0.805224655185185
00:36:16.592 --> 00:36:18.536 or truthify your your results
NOTE Confidence: 0.805224655185185
00:36:18.536 --> 00:36:21.119 based on what is or isn't there,
NOTE Confidence: 0.805224655185185
00:36:21.120 --> 00:36:23.115 at least in terms of the anatomical
NOTE Confidence: 0.805224655185185
00:36:23.115 --> 00:36:24.600 basis of these circuitry.
NOTE Confidence: 0.805224655185185
00:36:24.600 --> 00:36:28.244 So it really opens up a really big
NOTE Confidence: 0.805224655185185
00:36:28.244 --> 00:36:30.668 domain where of investigation that can
NOTE Confidence: 0.805224655185185
00:36:30.668 --> 00:36:34.712 really be constrained by biological reality.
NOTE Confidence: 0.805224655185185
00:36:34.712 --> 00:36:36.960 So this is a family brain.
NOTE Confidence: 0.805224655185185
00:36:36.960 --> 00:36:39.850 One has to scale this up 1000 fold,
NOTE Confidence: 0.805224655185185
00:36:39.850 --> 00:36:42.825 3 hours of magnitude to get similar
NOTE Confidence: 0.805224655185185

00:36:42.825 --> 00:36:44.719 information from a mouse brain.
NOTE Confidence: 0.805224655185185

00:36:44.720 --> 00:36:46.742 So here's a paper from 2015
NOTE Confidence: 0.805224655185185

00:36:46.742 --> 00:36:49.241 Bobby Kasturi when he was in Jeff
NOTE Confidence: 0.805224655185185

00:36:49.241 --> 00:36:51.248 Lichtman's lab and here they analyzed.
NOTE Confidence: 0.805224655185185

00:36:51.248 --> 00:36:52.858 They reconstructed all the connections
NOTE Confidence: 0.805224655185185

00:36:52.858 --> 00:36:55.520 in a 1500 cubic Micron volume
NOTE Confidence: 0.805224655185185

00:36:55.520 --> 00:36:57.760 of the mouse neocortex.
NOTE Confidence: 0.805224655185185

00:36:57.760 --> 00:36:59.160 Since then it's been the
NOTE Confidence: 0.805224655185185

00:36:59.160 --> 00:37:00.280 effort's been scaled up.
NOTE Confidence: 0.805224655185185

00:37:00.280 --> 00:37:02.608 Here's some images from a preprint
NOTE Confidence: 0.805224655185185

00:37:02.608 --> 00:37:04.873 from Jeff Lichtman's lab in a
NOTE Confidence: 0.805224655185185

00:37:04.873 --> 00:37:07.438 cubic millimeter of human cortex.
NOTE Confidence: 0.805224655185185

00:37:07.440 --> 00:37:10.600 So they've scaled this up 500,000 fold.
NOTE Confidence: 0.805224655185185

00:37:10.600 --> 00:37:12.760 So lots of orders of magnitude,
NOTE Confidence: 0.805224655185185

00:37:12.760 --> 00:37:14.456 5 orders of magnitude,
NOTE Confidence: 0.805224655185185

00:37:14.456 --> 00:37:17.000 almost almost six orders of magnitude.

NOTE Confidence: 0.805224655185185
00:37:17.000 --> 00:37:19.055 And they've reconstructed about 50,000
NOTE Confidence: 0.805224655185185
00:37:19.055 --> 00:37:21.260 cells with 130 million synapses.
NOTE Confidence: 0.805224655185185
00:37:21.260 --> 00:37:22.640 This data set,
NOTE Confidence: 0.805224655185185
00:37:22.640 --> 00:37:25.517 which gives us beautiful pictures like this,
NOTE Confidence: 0.805224655185185
00:37:25.520 --> 00:37:28.880 takes up a petabyte of data.
NOTE Confidence: 0.805224655185185
00:37:28.880 --> 00:37:30.469 And to scale up to whole mouse
NOTE Confidence: 0.805224655185185
00:37:30.469 --> 00:37:31.640 brain is another 500 fold.
NOTE Confidence: 0.805224655185185
00:37:31.640 --> 00:37:32.680 Let's call it 1000 fold.
NOTE Confidence: 0.805224655185185
00:37:32.680 --> 00:37:35.564 So that means that a synapse level
NOTE Confidence: 0.805224655185185
00:37:35.564 --> 00:37:37.528 reconstructed entire mouse brain is
NOTE Confidence: 0.805224655185185
00:37:37.528 --> 00:37:39.838 going to occupy an exabyte of data.
NOTE Confidence: 0.805224655185185
00:37:39.840 --> 00:37:40.872 That's a lot,
NOTE Confidence: 0.805224655185185
00:37:40.872 --> 00:37:41.216 OK.
NOTE Confidence: 0.805224655185185
00:37:41.216 --> 00:37:43.280 Similar studies have been done by
NOTE Confidence: 0.805224655185185
00:37:43.347 --> 00:37:45.639 the IRPA Fund and Microns project,
NOTE Confidence: 0.805224655185185

00:37:45.640 --> 00:37:47.500 where they've also looked at about
NOTE Confidence: 0.805224655185185

00:37:47.500 --> 00:37:49.375 a cubic millimeter of cortex in
NOTE Confidence: 0.805224655185185

00:37:49.375 --> 00:37:52.520 the mouse brain, in visual cortex.
NOTE Confidence: 0.805224655185185

00:37:52.520 --> 00:37:53.364 In addition,
NOTE Confidence: 0.805224655185185

00:37:53.364 --> 00:37:54.630 they've actually acquired
NOTE Confidence: 0.805224655185185

00:37:54.630 --> 00:37:56.784 functional data on these, on these,
NOTE Confidence: 0.805224655185185

00:37:56.784 --> 00:37:59.152 on the sample, which kind of it.
NOTE Confidence: 0.805224655185185

00:37:59.152 --> 00:38:01.242 It's the beginnings of functionalizing
NOTE Confidence: 0.805224655185185

00:38:01.242 --> 00:38:03.178 the static anatomical studies.
NOTE Confidence: 0.805224655185185

00:38:03.178 --> 00:38:04.210 But again that we're
NOTE Confidence: 0.805224655185185

00:38:04.210 --> 00:38:05.500 looking at over an exabyte
NOTE Confidence: 0.7791957875

00:38:05.551 --> 00:38:07.250 of data. So this is the big
NOTE Confidence: 0.7791957875

00:38:07.250 --> 00:38:08.314 challenge for the field.
NOTE Confidence: 0.7791957875

00:38:08.320 --> 00:38:09.692 How do we develop,
NOTE Confidence: 0.7791957875

00:38:09.692 --> 00:38:12.359 develop tools where we can scale this up.
NOTE Confidence: 0.7791957875

00:38:12.360 --> 00:38:14.808 The bad news is we we have 1000 fold

NOTE Confidence: 0.7791957875

00:38:14.808 --> 00:38:17.159 scale up to accomplish the good news,

NOTE Confidence: 0.7791957875

00:38:17.160 --> 00:38:19.400 it's only 1000 fold.

NOTE Confidence: 0.7791957875

00:38:19.400 --> 00:38:21.560 OK, so we've launched this

NOTE Confidence: 0.7791957875

00:38:21.560 --> 00:38:22.760 brain connects project.

NOTE Confidence: 0.7791957875

00:38:22.760 --> 00:38:24.727 The first five year phase is to

NOTE Confidence: 0.7791957875

00:38:24.727 --> 00:38:26.207 develop tools where we can do

NOTE Confidence: 0.7791957875

00:38:26.207 --> 00:38:28.200 this not on one mouse brain but

NOTE Confidence: 0.7791957875

00:38:28.200 --> 00:38:30.068 on multiple mouse brains and also

NOTE Confidence: 0.7791957875

00:38:30.068 --> 00:38:31.568 develop tools for looking at

NOTE Confidence: 0.7791957875

00:38:31.568 --> 00:38:33.480 big brains at less resolution.

NOTE Confidence: 0.7791957875

00:38:33.480 --> 00:38:36.470 We just funded 11 grants from 40

NOTE Confidence: 0.7791957875

00:38:36.470 --> 00:38:38.370 universities and research institutions

NOTE Confidence: 0.7791957875

00:38:38.370 --> 00:38:40.948 across the globe and over the next

NOTE Confidence: 0.7791957875

00:38:40.948 --> 00:38:43.101 five years they're going to help us

NOTE Confidence: 0.7791957875

00:38:43.101 --> 00:38:44.577 identify scalable technologies that

NOTE Confidence: 0.7791957875

00:38:44.577 --> 00:38:46.808 can do in the connectomics world
NOTE Confidence: 0.7791957875

00:38:46.808 --> 00:38:49.450 what the Cell Cell Census Group has
NOTE Confidence: 0.7791957875

00:38:49.450 --> 00:38:51.520 done in the cell Atlassian world.
NOTE Confidence: 0.7791957875

00:38:51.520 --> 00:38:54.316 And the projects fall into three
NOTE Confidence: 0.7791957875

00:38:54.316 --> 00:38:55.714 complementary core technologies.
NOTE Confidence: 0.7791957875

00:38:55.720 --> 00:38:57.345 One is using high throughput
NOTE Confidence: 0.7791957875

00:38:57.345 --> 00:38:57.995 electron microscopy.
NOTE Confidence: 0.7791957875

00:38:58.000 --> 00:38:59.975 Here's just an example reconstruction
NOTE Confidence: 0.7791957875

00:38:59.975 --> 00:39:01.982 from the Microns group using
NOTE Confidence: 0.7791957875

00:39:01.982 --> 00:39:03.670 pretty cool molecular sequencing
NOTE Confidence: 0.7791957875

00:39:03.670 --> 00:39:07.380 tools to map out on a large scale
NOTE Confidence: 0.7791957875

00:39:07.380 --> 00:39:09.420 connectivity patterns as well as
NOTE Confidence: 0.7791957875

00:39:09.420 --> 00:39:11.460 optical and X-ray tomography to map
NOTE Confidence: 0.7791957875

00:39:11.460 --> 00:39:13.920 out the these broader connections.
NOTE Confidence: 0.7791957875

00:39:13.920 --> 00:39:15.240 So we're very excited about this.
NOTE Confidence: 0.7791957875

00:39:15.240 --> 00:39:16.944 The project just launched this past

NOTE Confidence: 0.7791957875

00:39:16.944 --> 00:39:18.622 year and we're looking forward to

NOTE Confidence: 0.7791957875

00:39:18.622 --> 00:39:20.092 seeing progress that will get us

NOTE Confidence: 0.7791957875

00:39:20.092 --> 00:39:22.172 to the second phase where we could

NOTE Confidence: 0.7791957875

00:39:22.172 --> 00:39:24.040 actually Start learning about whole brains.

NOTE Confidence: 0.7791957875

00:39:24.040 --> 00:39:25.320 But in the meantime,

NOTE Confidence: 0.7791957875

00:39:25.320 --> 00:39:27.744 the groups are charged with getting

NOTE Confidence: 0.7791957875

00:39:27.744 --> 00:39:29.777 us some good biological information

NOTE Confidence: 0.7791957875

00:39:29.777 --> 00:39:31.862 about cell significant cell volumes

NOTE Confidence: 0.7791957875

00:39:31.862 --> 00:39:33.113 of the brain.

NOTE Confidence: 0.7791957875

00:39:33.120 --> 00:39:34.527 And right now one of the key

NOTE Confidence: 0.7791957875

00:39:34.527 --> 00:39:35.748 projects is on hippocampus and

NOTE Confidence: 0.7791957875

00:39:35.748 --> 00:39:37.434 another one is on basal ganglia.

NOTE Confidence: 0.7791957875

00:39:37.440 --> 00:39:39.600 So stay tuned for that.

NOTE Confidence: 0.7791957875

00:39:39.600 --> 00:39:40.103 OK.

NOTE Confidence: 0.7791957875

00:39:40.103 --> 00:39:43.624 So once we start having in hand

NOTE Confidence: 0.7791957875

00:39:43.624 --> 00:39:46.040 this inventory of cell types
NOTE Confidence: 0.7791957875

00:39:46.040 --> 00:39:47.108 and their connectivity patterns,
NOTE Confidence: 0.7791957875

00:39:47.108 --> 00:39:49.634 we want to be able to test hypothesis of
NOTE Confidence: 0.7791957875

00:39:49.634 --> 00:39:51.671 what these cells and circuits are doing.
NOTE Confidence: 0.7791957875

00:39:51.680 --> 00:39:53.608 And this is where the armamentarium
NOTE Confidence: 0.7791957875

00:39:53.608 --> 00:39:55.848 or toolkit for accessing these
NOTE Confidence: 0.7791957875

00:39:55.848 --> 00:39:57.640 cell types comes in.
NOTE Confidence: 0.7791957875

00:39:57.640 --> 00:39:59.537 The main the workhorse for these studies
NOTE Confidence: 0.7791957875

00:39:59.537 --> 00:40:01.747 so far has been Adeno associated virus
NOTE Confidence: 0.7791957875

00:40:01.747 --> 00:40:03.757 which has been developed for years.
NOTE Confidence: 0.7791957875

00:40:03.760 --> 00:40:05.350 It's already been used in gene
NOTE Confidence: 0.7791957875

00:40:05.350 --> 00:40:06.771 therapies that we've been reading
NOTE Confidence: 0.7791957875

00:40:06.771 --> 00:40:09.130 about and right now it's it's
NOTE Confidence: 0.7791957875

00:40:09.130 --> 00:40:11.772 kind of the the the standard and
NOTE Confidence: 0.7791957875

00:40:11.772 --> 00:40:13.537 we're hoping to develop develop
NOTE Confidence: 0.7791957875

00:40:13.537 --> 00:40:15.480 this with other viral vectors as

NOTE Confidence: 0.7791957875

00:40:15.480 --> 00:40:17.560 well as non non viral methods.

NOTE Confidence: 0.7791957875

00:40:17.560 --> 00:40:19.852 The the strategy here is there

NOTE Confidence: 0.7791957875

00:40:19.852 --> 00:40:21.380 are two complementary strategies

NOTE Confidence: 0.7791957875

00:40:21.443 --> 00:40:22.799 for gaining precision access

NOTE Confidence: 0.7791957875

00:40:22.799 --> 00:40:24.833 to cell types in the brain.

NOTE Confidence: 0.7791957875

00:40:24.840 --> 00:40:26.430 One is to leverage the information

NOTE Confidence: 0.7791957875

00:40:26.430 --> 00:40:28.558 coming out of the cell census projects

NOTE Confidence: 0.7791957875

00:40:28.560 --> 00:40:30.675 that have identified cell type

NOTE Confidence: 0.7791957875

00:40:30.675 --> 00:40:33.280 specific expression of genes as well

NOTE Confidence: 0.7791957875

00:40:33.280 --> 00:40:35.360 as candidate enhancer regions that

NOTE Confidence: 0.7791957875

00:40:35.360 --> 00:40:37.920 might be driving that specificity.

NOTE Confidence: 0.7791957875

00:40:37.920 --> 00:40:39.285 So and the other is going to

NOTE Confidence: 0.7791957875

00:40:39.285 --> 00:40:40.480 be on capsule development.

NOTE Confidence: 0.7791957875

00:40:40.480 --> 00:40:42.195 So I'll go through this in turn.

NOTE Confidence: 0.7791957875

00:40:42.200 --> 00:40:42.920 So Basilica,

NOTE Confidence: 0.7791957875

00:40:42.920 --> 00:40:45.080 Tasik and colleagues of the Allen
NOTE Confidence: 0.7791957875

00:40:45.080 --> 00:40:47.490 suit have gone through and screened
NOTE Confidence: 0.7791957875

00:40:47.490 --> 00:40:49.920 this information from the cell census
NOTE Confidence: 0.7791957875

00:40:49.991 --> 00:40:52.351 projects and the different ways
NOTE Confidence: 0.7791957875

00:40:52.351 --> 00:40:54.239 of identifying putative enhancers.
NOTE Confidence: 0.7791957875

00:40:54.240 --> 00:40:56.011 They can show that they actually do
NOTE Confidence: 0.7791957875

00:40:56.011 --> 00:40:57.879 give us good restricted activity,
NOTE Confidence: 0.7791957875

00:40:57.880 --> 00:41:00.358 and one can start combining this
NOTE Confidence: 0.7791957875

00:41:00.358 --> 00:41:01.597 in combinatorial arrays
NOTE Confidence: 0.900437546666667

00:41:01.600 --> 00:41:03.516 to give more targeted,
NOTE Confidence: 0.900437546666667

00:41:03.516 --> 00:41:05.911 more targeted expression of payloads
NOTE Confidence: 0.900437546666667

00:41:05.911 --> 00:41:08.864 that are carried by the AAB in
NOTE Confidence: 0.900437546666667

00:41:08.864 --> 00:41:11.840 molecularly identified cell types.
NOTE Confidence: 0.900437546666667

00:41:11.840 --> 00:41:13.970 Now, work led by Viviana Grotonaro
NOTE Confidence: 0.900437546666667

00:41:13.970 --> 00:41:15.751 in collaboration with various folks
NOTE Confidence: 0.900437546666667

00:41:15.751 --> 00:41:17.557 at UCSD and the Allen Institute,

NOTE Confidence: 0.900437546666667

00:41:17.560 --> 00:41:19.780 have been busy engineering the capsules

NOTE Confidence: 0.900437546666667

00:41:19.780 --> 00:41:22.399 to tune the tropism of these viruses.

NOTE Confidence: 0.900437546666667

00:41:22.400 --> 00:41:24.736 One of the big what advance this has

NOTE Confidence: 0.900437546666667

00:41:24.736 --> 00:41:26.972 been that Viviano's group and others

NOTE Confidence: 0.900437546666667

00:41:26.972 --> 00:41:29.037 others have also identified capsid

NOTE Confidence: 0.900437546666667

00:41:29.037 --> 00:41:31.099 variations using directed evolution that

NOTE Confidence: 0.900437546666667

00:41:31.099 --> 00:41:33.475 actually cross the blood brain barrier.

NOTE Confidence: 0.900437546666667

00:41:33.480 --> 00:41:35.010 Someone can actually deliver these

NOTE Confidence: 0.900437546666667

00:41:35.010 --> 00:41:37.431 vectors to the two brain cell types not

NOTE Confidence: 0.900437546666667

00:41:37.431 --> 00:41:39.608 not just by injecting into the brain

NOTE Confidence: 0.900437546666667

00:41:39.608 --> 00:41:41.759 itself but by injecting bloodstream

NOTE Confidence: 0.900437546666667

00:41:41.760 --> 00:41:44.160 and they've actually being able to

NOTE Confidence: 0.900437546666667

00:41:44.160 --> 00:41:46.885 find variants that target get across a

NOTE Confidence: 0.900437546666667

00:41:46.885 --> 00:41:49.135 blood brain barrier and target neurons

NOTE Confidence: 0.900437546666667

00:41:49.135 --> 00:41:51.880 in various non human primate models.

NOTE Confidence: 0.900437546666667

00:41:51.880 --> 00:41:54.141 It shows enhanced delivery to the brain
NOTE Confidence: 0.900437546666667

00:41:54.141 --> 00:41:55.813 a very importantly reduced delivery
NOTE Confidence: 0.900437546666667

00:41:55.813 --> 00:41:58.074 to the to the liver and hepatotoxicity
NOTE Confidence: 0.900437546666667

00:41:58.074 --> 00:42:00.399 is one of the big bugaboos of human
NOTE Confidence: 0.900437546666667

00:42:00.399 --> 00:42:02.470 gene therapy and they can they can
NOTE Confidence: 0.900437546666667

00:42:02.470 --> 00:42:03.678 observe expression mostly neurons.
NOTE Confidence: 0.900437546666667

00:42:03.680 --> 00:42:05.444 They also they have other variants
NOTE Confidence: 0.900437546666667

00:42:05.444 --> 00:42:07.320 that also target non neural cells
NOTE Confidence: 0.900437546666667

00:42:07.320 --> 00:42:09.150 and it facilitates studies and non
NOTE Confidence: 0.900437546666667

00:42:09.150 --> 00:42:11.138 human primates here as well as
NOTE Confidence: 0.900437546666667

00:42:11.138 --> 00:42:12.200 uncultured human neurons.
NOTE Confidence: 0.900437546666667

00:42:12.200 --> 00:42:13.936 So these are just some of the efforts
NOTE Confidence: 0.900437546666667

00:42:13.936 --> 00:42:15.852 that are underway geared toward
NOTE Confidence: 0.900437546666667

00:42:15.852 --> 00:42:18.482 getting better and more precise
NOTE Confidence: 0.900437546666667

00:42:18.482 --> 00:42:22.022 access to cell types in in post Natal
NOTE Confidence: 0.900437546666667

00:42:22.022 --> 00:42:24.628 brains with the goal of interrogating

NOTE Confidence: 0.900437546666667
00:42:24.628 --> 00:42:26.368 circuits to develop better models
NOTE Confidence: 0.900437546666667
00:42:26.368 --> 00:42:27.760 for neuro circuit function.
NOTE Confidence: 0.900437546666667
00:42:27.760 --> 00:42:29.776 But I think these are going to serve
NOTE Confidence: 0.900437546666667
00:42:29.776 --> 00:42:32.820 as the progenitors for precision gene
NOTE Confidence: 0.900437546666667
00:42:32.820 --> 00:42:35.995 therapies for human brain disorders.
NOTE Confidence: 0.900437546666667
00:42:36.000 --> 00:42:38.032 So these are the three projects that we've
NOTE Confidence: 0.900437546666667
00:42:38.032 --> 00:42:39.716 launched over the last couple of years.
NOTE Confidence: 0.900437546666667
00:42:39.720 --> 00:42:41.664 We think they will mutually reinforce
NOTE Confidence: 0.900437546666667
00:42:41.664 --> 00:42:43.744 each other and provide researchers with
NOTE Confidence: 0.900437546666667
00:42:43.744 --> 00:42:45.916 new tools to investigate neuro circuit
NOTE Confidence: 0.900437546666667
00:42:45.916 --> 00:42:48.222 function in a way that we couldn't have
NOTE Confidence: 0.900437546666667
00:42:48.222 --> 00:42:52.040 imagined just a few 5 plus years ago.
NOTE Confidence: 0.900437546666667
00:42:52.040 --> 00:42:52.556 More recently,
NOTE Confidence: 0.900437546666667
00:42:52.556 --> 00:42:54.362 we just launched what we call the
NOTE Confidence: 0.900437546666667
00:42:54.362 --> 00:42:55.887 Brain Behavior Quantification and
NOTE Confidence: 0.900437546666667

00:42:55.887 --> 00:42:57.917 Synchronization Program or BBQS program.
NOTE Confidence: 0.900437546666667

00:42:57.920 --> 00:43:00.648 And here the goal is to develop and
NOTE Confidence: 0.900437546666667

00:43:00.648 --> 00:43:03.473 validate new tools for analyzing and
NOTE Confidence: 0.900437546666667

00:43:03.473 --> 00:43:05.757 precisely quantifying complex behaviors.
NOTE Confidence: 0.900437546666667

00:43:05.760 --> 00:43:06.900 That's a BBQ part.
NOTE Confidence: 0.900437546666667

00:43:06.900 --> 00:43:09.693 The S part is now then to synchronize
NOTE Confidence: 0.900437546666667

00:43:09.693 --> 00:43:12.082 this information with high resolution
NOTE Confidence: 0.900437546666667

00:43:12.082 --> 00:43:14.728 neural activity mapping to really start
NOTE Confidence: 0.900437546666667

00:43:14.728 --> 00:43:17.285 getting at causality between neural
NOTE Confidence: 0.900437546666667

00:43:17.285 --> 00:43:19.960 circuit activity and behavioral output.
NOTE Confidence: 0.900437546666667

00:43:19.960 --> 00:43:22.210 So we just launched a bunch of RF as
NOTE Confidence: 0.900437546666667

00:43:22.210 --> 00:43:25.093 or now we call them Notice of funding
NOTE Confidence: 0.900437546666667

00:43:25.093 --> 00:43:27.480 opportunities or Nofos covering non human,
NOTE Confidence: 0.900437546666667

00:43:27.480 --> 00:43:30.100 primarily non human models,
NOTE Confidence: 0.900437546666667

00:43:30.100 --> 00:43:32.720 human and clinical models.
NOTE Confidence: 0.900437546666667

00:43:32.720 --> 00:43:34.736 The efforts here are going to be

NOTE Confidence: 0.900437546666667
00:43:34.736 --> 00:43:36.207 coordinated through a data center
NOTE Confidence: 0.900437546666667
00:43:36.207 --> 00:43:37.038 and AI center.
NOTE Confidence: 0.900437546666667
00:43:37.040 --> 00:43:38.552 You could imagine that there's going
NOTE Confidence: 0.900437546666667
00:43:38.552 --> 00:43:40.677 to be a lot of information here
NOTE Confidence: 0.900437546666667
00:43:40.677 --> 00:43:42.789 that's going to require ever more
NOTE Confidence: 0.900437546666667
00:43:42.789 --> 00:43:44.519 sophisticated computational techniques.
NOTE Confidence: 0.900437546666667
00:43:44.520 --> 00:43:46.844 We had just had a workshop on
NOTE Confidence: 0.900437546666667
00:43:46.844 --> 00:43:48.410 developing on identifying opportunities
NOTE Confidence: 0.900437546666667
00:43:48.410 --> 00:43:50.438 and new sensor technologies.
NOTE Confidence: 0.900437546666667
00:43:50.440 --> 00:43:52.820 And we have an ongoing program throughout
NOTE Confidence: 0.900437546666667
00:43:52.820 --> 00:43:55.245 the Brain initiative in terms of how to
NOTE Confidence: 0.900437546666667
00:43:55.245 --> 00:43:56.920 store access and analyse these data.
NOTE Confidence: 0.900437546666667
00:43:56.920 --> 00:43:58.789 And together we hope to build a
NOTE Confidence: 0.900437546666667
00:43:58.789 --> 00:43:59.927 consortium watching that we've
NOTE Confidence: 0.900437546666667
00:43:59.927 --> 00:44:01.357 done for these other projects,
NOTE Confidence: 0.900437546666667

00:44:01.360 --> 00:44:03.510 for really developing and deploying
NOTE Confidence: 0.900437546666667

00:44:03.510 --> 00:44:05.660 new tools for understanding the
NOTE Confidence: 0.8011100992

00:44:05.729 --> 00:44:07.624 circuit basis of behavior that
NOTE Confidence: 0.8011100992

00:44:07.624 --> 00:44:09.995 that will complement and add to
NOTE Confidence: 0.8011100992

00:44:09.995 --> 00:44:11.639 our current circuits program.
NOTE Confidence: 0.8011100992

00:44:11.640 --> 00:44:13.005 So here's just an example of what
NOTE Confidence: 0.8011100992

00:44:13.005 --> 00:44:14.478 one might be interested in doing.
NOTE Confidence: 0.8011100992

00:44:14.480 --> 00:44:18.040 This is from Cory Miller's group at UCSD
NOTE Confidence: 0.8011100992

00:44:18.040 --> 00:44:21.736 and he's looking at what what a marmoset
NOTE Confidence: 0.8011100992

00:44:21.736 --> 00:44:24.020 does while it's capturing its prey.
NOTE Confidence: 0.8011100992

00:44:24.020 --> 00:44:25.820 And they could break this down
NOTE Confidence: 0.8011100992

00:44:25.820 --> 00:44:27.318 into three main behaviors,
NOTE Confidence: 0.8011100992

00:44:27.320 --> 00:44:29.440 either capture and flight stalk,
NOTE Confidence: 0.8011100992

00:44:29.440 --> 00:44:32.158 paws and lunge and mouth capture.
NOTE Confidence: 0.8011100992

00:44:32.160 --> 00:44:34.645 And they can do this with markerless
NOTE Confidence: 0.8011100992

00:44:34.645 --> 00:44:36.336 motion tracking pretty much in the

NOTE Confidence: 0.8011100992

00:44:36.336 --> 00:44:38.280 in a kind of a naturalistic setting.

NOTE Confidence: 0.8011100992

00:44:38.280 --> 00:44:39.840 And being able to quantitatively

NOTE Confidence: 0.8011100992

00:44:39.840 --> 00:44:41.088 characterize behavior in this

NOTE Confidence: 0.8011100992

00:44:41.088 --> 00:44:43.106 way is going to be critical for

NOTE Confidence: 0.8011100992

00:44:43.106 --> 00:44:44.680 understanding the neural basis behavior.

NOTE Confidence: 0.8011100992

00:44:44.680 --> 00:44:46.444 So there's just one example of what

NOTE Confidence: 0.8011100992

00:44:46.444 --> 00:44:48.630 I can be thinking about with better

NOTE Confidence: 0.8011100992

00:44:48.630 --> 00:44:52.120 tools for quantifying behavior.

NOTE Confidence: 0.8011100992

00:44:52.120 --> 00:44:54.676 Similar efforts are going on to

NOTE Confidence: 0.8011100992

00:44:54.680 --> 00:44:57.795 understand what I call awake behaving humans.

NOTE Confidence: 0.8011100992

00:44:57.800 --> 00:44:59.080 So this is a group from the market,

NOTE Confidence: 0.8011100992

00:44:59.080 --> 00:45:01.264 but this is our work from the Markovich

NOTE Confidence: 0.8011100992

00:45:01.264 --> 00:45:03.144 and Sedana groups at UCLA where

NOTE Confidence: 0.8011100992

00:45:03.144 --> 00:45:05.160 they've developed a miniaturized

NOTE Confidence: 0.8011100992

00:45:05.160 --> 00:45:07.440 device that can be worn by the patient

NOTE Confidence: 0.8011100992

00:45:07.440 --> 00:45:09.561 and this is called a neuro stack
NOTE Confidence: 0.8011100992

00:45:09.561 --> 00:45:11.720 device to both record and stimulate.
NOTE Confidence: 0.8011100992

00:45:11.720 --> 00:45:13.820 These are patients that are in the
NOTE Confidence: 0.8011100992

00:45:13.820 --> 00:45:15.232 epilepsy monitoring unit and it's
NOTE Confidence: 0.8011100992

00:45:15.232 --> 00:45:17.024 really great to be able to record
NOTE Confidence: 0.8011100992

00:45:17.024 --> 00:45:18.726 from patients who are willing
NOTE Confidence: 0.8011100992

00:45:18.726 --> 00:45:20.114 to participate in studies,
NOTE Confidence: 0.8011100992

00:45:20.120 --> 00:45:21.888 but even better if they can get out
NOTE Confidence: 0.8011100992

00:45:21.888 --> 00:45:23.967 of bed and start walking around and
NOTE Confidence: 0.8011100992

00:45:23.967 --> 00:45:25.760 navigate the space that they're in.
NOTE Confidence: 0.8011100992

00:45:25.760 --> 00:45:28.224 It's a wireless mode that can record
NOTE Confidence: 0.8011100992

00:45:28.224 --> 00:45:30.080 single neuron activity and also
NOTE Confidence: 0.8011100992

00:45:30.080 --> 00:45:32.480 combine this with eye tracking and
NOTE Confidence: 0.8011100992

00:45:32.480 --> 00:45:35.080 other parameters having to do with
NOTE Confidence: 0.8011100992

00:45:35.080 --> 00:45:37.164 movement and and other behavioral
NOTE Confidence: 0.8011100992

00:45:37.164 --> 00:45:38.397 and physiological outputs.

NOTE Confidence: 0.8011100992

00:45:38.400 --> 00:45:40.374 They have this onboard processing unit

NOTE Confidence: 0.8011100992

00:45:40.374 --> 00:45:42.061 that enables real time inferences

NOTE Confidence: 0.8011100992

00:45:42.061 --> 00:45:44.217 that can be used in closed lip

NOTE Confidence: 0.8011100992

00:45:44.217 --> 00:45:46.078 stimulation for the treatment as well.

NOTE Confidence: 0.8011100992

00:45:46.080 --> 00:45:47.916 So this is very exciting stuff.

NOTE Confidence: 0.8011100992

00:45:47.920 --> 00:45:50.146 These kinds of studies are what

NOTE Confidence: 0.8011100992

00:45:50.146 --> 00:45:52.582 we're hoping to be supporting as

NOTE Confidence: 0.8011100992

00:45:52.582 --> 00:45:54.757 we launch the BBQS program.

NOTE Confidence: 0.8011100992

00:45:54.760 --> 00:45:56.426 And this gets us to the window

NOTE Confidence: 0.8011100992

00:45:56.426 --> 00:45:58.028 of opportunity we have for

NOTE Confidence: 0.8011100992

00:45:58.028 --> 00:45:59.279 understanding human neuroscience.

NOTE Confidence: 0.8011100992

00:45:59.280 --> 00:46:01.518 The human brain,

NOTE Confidence: 0.8011100992

00:46:01.520 --> 00:46:03.435 for patients who are undergoing

NOTE Confidence: 0.8011100992

00:46:03.435 --> 00:46:04.967 treatments for other disorders

NOTE Confidence: 0.8011100992

00:46:04.967 --> 00:46:06.945 and who are willing to participate

NOTE Confidence: 0.8011100992

00:46:06.945 --> 00:46:09.171 in research with us is really a
NOTE Confidence: 0.8011100992

00:46:09.171 --> 00:46:11.049 window into the the human brain
NOTE Confidence: 0.8011100992

00:46:11.049 --> 00:46:13.066 to understand processes like a
NOTE Confidence: 0.8011100992

00:46:13.066 --> 00:46:15.838 memory and emotion and so forth,
NOTE Confidence: 0.8011100992

00:46:15.840 --> 00:46:18.120 which kind of gets us into some interesting
NOTE Confidence: 0.8011100992

00:46:18.120 --> 00:46:20.357 space about the ethics of what we're doing.
NOTE Confidence: 0.8011100992

00:46:20.360 --> 00:46:21.836 We'd have to be aware not
NOTE Confidence: 0.8011100992

00:46:21.836 --> 00:46:23.280 only of issues of safety,
NOTE Confidence: 0.8011100992

00:46:23.280 --> 00:46:26.157 but also privacy agency and so forth.
NOTE Confidence: 0.8011100992

00:46:26.160 --> 00:46:27.400 We take this very seriously.
NOTE Confidence: 0.8011100992

00:46:27.400 --> 00:46:28.381 The BRAIN Initiative,
NOTE Confidence: 0.8011100992

00:46:28.381 --> 00:46:30.343 we have a neuroethics working group
NOTE Confidence: 0.8011100992

00:46:30.343 --> 00:46:32.133 that helps advise us about upcoming
NOTE Confidence: 0.8011100992

00:46:32.133 --> 00:46:33.598 as well as current challenges.
NOTE Confidence: 0.8011100992

00:46:33.600 --> 00:46:35.434 We have a set of new ethics
NOTE Confidence: 0.8011100992

00:46:35.434 --> 00:46:35.958 guiding principles.

NOTE Confidence: 0.8011100992

00:46:35.960 --> 00:46:39.320 We hold workshops each year to examine

NOTE Confidence: 0.8011100992

00:46:39.320 --> 00:46:41.400 these issues to hopefully stay

NOTE Confidence: 0.8011100992

00:46:41.400 --> 00:46:43.700 ahead of any potential issues that

NOTE Confidence: 0.8011100992

00:46:43.700 --> 00:46:45.950 might arise based on getting into

NOTE Confidence: 0.8011100992

00:46:46.016 --> 00:46:48.240 a frankly really new new territory.

NOTE Confidence: 0.8011100992

00:46:48.240 --> 00:46:49.040 So we take this very,

NOTE Confidence: 0.8011100992

00:46:49.040 --> 00:46:51.240 very seriously.

NOTE Confidence: 0.8011100992

00:46:51.240 --> 00:46:53.360 Another issue that we're very,

NOTE Confidence: 0.8011100992

00:46:53.360 --> 00:46:54.935 very much interested in supporting

NOTE Confidence: 0.8011100992

00:46:54.935 --> 00:46:57.240 is is data science and informatics.

NOTE Confidence: 0.8011100992

00:46:57.240 --> 00:46:59.230 The legacy of any scientific

NOTE Confidence: 0.8011100992

00:46:59.230 --> 00:47:01.220 project really is going to

NOTE Confidence: 0.8898771065

00:47:01.297 --> 00:47:03.469 be in the data and resources

NOTE Confidence: 0.8898771065

00:47:03.469 --> 00:47:04.917 that we leave behind.

NOTE Confidence: 0.8898771065

00:47:04.920 --> 00:47:06.438 I think you can appreciate that

NOTE Confidence: 0.8898771065

00:47:06.438 --> 00:47:08.318 from the studies I just showed you.
NOTE Confidence: 0.8898771065

00:47:08.320 --> 00:47:10.609 We're generating a ton of data and
NOTE Confidence: 0.8898771065

00:47:10.609 --> 00:47:13.479 we've set up eight brain data archives.
NOTE Confidence: 0.8898771065

00:47:13.480 --> 00:47:15.000 I'm just showing 6 here.
NOTE Confidence: 0.8898771065

00:47:15.000 --> 00:47:16.911 And our our mission is really to
NOTE Confidence: 0.8898771065

00:47:16.911 --> 00:47:18.957 organize them so they can be findable,
NOTE Confidence: 0.8898771065

00:47:18.960 --> 00:47:20.900 accessible, interoperable and reusable.
NOTE Confidence: 0.8898771065

00:47:20.900 --> 00:47:22.840 It's a huge challenge.
NOTE Confidence: 0.8898771065

00:47:22.840 --> 00:47:27.240 I imagine many of you are vexed by the new
NOTE Confidence: 0.8898771065

00:47:27.240 --> 00:47:29.160 NIH's data management and sharing policy,
NOTE Confidence: 0.8898771065

00:47:29.160 --> 00:47:30.672 and we will try to work very hard
NOTE Confidence: 0.8898771065

00:47:30.672 --> 00:47:31.998 with you to make this happen,
NOTE Confidence: 0.8898771065

00:47:32.000 --> 00:47:33.624 but we're at least a year ahead
NOTE Confidence: 0.8898771065

00:47:33.624 --> 00:47:35.437 of the curve for the rest of NIH.
NOTE Confidence: 0.8898771065

00:47:35.440 --> 00:47:36.040 But again,
NOTE Confidence: 0.8898771065

00:47:36.040 --> 00:47:37.540 this is something we're taking

NOTE Confidence: 0.8898771065

00:47:37.540 --> 00:47:39.200 very seriously and we really try.

NOTE Confidence: 0.8898771065

00:47:39.200 --> 00:47:42.376 We need to be able to make these

NOTE Confidence: 0.8898771065

00:47:42.376 --> 00:47:44.816 data not only accessible but

NOTE Confidence: 0.8898771065

00:47:44.816 --> 00:47:47.027 also interoperable between these

NOTE Confidence: 0.8898771065

00:47:47.027 --> 00:47:48.359 different modalities.

NOTE Confidence: 0.8898771065

00:47:48.360 --> 00:47:48.886 And finally,

NOTE Confidence: 0.8898771065

00:47:48.886 --> 00:47:50.727 one of the very important things that

NOTE Confidence: 0.8898771065

00:47:50.727 --> 00:47:52.920 we're getting into is building a

NOTE Confidence: 0.8898771065

00:47:52.920 --> 00:47:55.120 stronger and more sustainable workforce.

NOTE Confidence: 0.8898771065

00:47:55.120 --> 00:47:56.388 Numerous studies have shown

NOTE Confidence: 0.8898771065

00:47:56.388 --> 00:47:57.973 that diversity of thought leads

NOTE Confidence: 0.8898771065

00:47:57.973 --> 00:47:59.160 to better outcomes,

NOTE Confidence: 0.8898771065

00:47:59.160 --> 00:48:01.440 more creative solutions to tough problems,

NOTE Confidence: 0.8898771065

00:48:01.440 --> 00:48:03.448 and I think the human brain is the

NOTE Confidence: 0.8898771065

00:48:03.448 --> 00:48:04.838 toughest problem we can work with.

NOTE Confidence: 0.8898771065

00:48:04.840 --> 00:48:07.717 We have a couple of different approaches,
NOTE Confidence: 0.8898771065

00:48:07.720 --> 00:48:08.380 funding,
NOTE Confidence: 0.8898771065

00:48:08.380 --> 00:48:10.360 funding mechanisms for
NOTE Confidence: 0.8898771065

00:48:10.360 --> 00:48:13.000 for developing a stronger,
NOTE Confidence: 0.8898771065

00:48:13.000 --> 00:48:14.296 more diverse workforce.
NOTE Confidence: 0.8898771065

00:48:14.296 --> 00:48:16.456 We're doing capacity building with
NOTE Confidence: 0.8898771065

00:48:16.456 --> 00:48:18.181 various programs and very importantly,
NOTE Confidence: 0.8898771065

00:48:18.181 --> 00:48:20.190 a couple of years ago we introduced
NOTE Confidence: 0.8898771065

00:48:20.249 --> 00:48:22.247 what's called the Plan for Enhancing
NOTE Confidence: 0.8898771065

00:48:22.247 --> 00:48:23.905 Diverse Perspectives where we require
NOTE Confidence: 0.8898771065

00:48:23.905 --> 00:48:25.537 applicants to tell us how they're
NOTE Confidence: 0.8898771065

00:48:25.537 --> 00:48:27.848 going to use diverse perspectives in
NOTE Confidence: 0.8898771065

00:48:27.848 --> 00:48:31.320 their team to to do better science.
NOTE Confidence: 0.8898771065

00:48:31.320 --> 00:48:33.280 We have a number of funding opportunities,
NOTE Confidence: 0.8898771065

00:48:33.280 --> 00:48:35.105 general funding opportunities at F32
NOTE Confidence: 0.8898771065

00:48:35.105 --> 00:48:37.749 post doctoral awards as well as a

NOTE Confidence: 0.8898771065

00:48:37.749 --> 00:48:39.634 Clinician Scientist Mentored Career award.

NOTE Confidence: 0.8898771065

00:48:39.640 --> 00:48:41.848 Down below in the blue are

NOTE Confidence: 0.8898771065

00:48:41.848 --> 00:48:42.952 diversity focus mechanisms.

NOTE Confidence: 0.8898771065

00:48:42.960 --> 00:48:46.040 We just signed on to the Blueprint and

NOTE Confidence: 0.8898771065

00:48:46.040 --> 00:48:48.626 Door program for getting kids in kids

NOTE Confidence: 0.8898771065

00:48:48.626 --> 00:48:50.438 folks in at the undergraduate level

NOTE Confidence: 0.947299465

00:48:52.880 --> 00:48:55.658 F99K00 and K99R00 transition awards.

NOTE Confidence: 0.947299465

00:48:55.658 --> 00:48:58.336 The the first one is for late stage

NOTE Confidence: 0.947299465

00:48:58.336 --> 00:49:00.328 graduate students going out to do

NOTE Confidence: 0.947299465

00:49:00.328 --> 00:49:02.583 postdocs and the second one is similar

NOTE Confidence: 0.947299465

00:49:02.583 --> 00:49:05.121 to the Parent Pathway to Independence

NOTE Confidence: 0.947299465

00:49:05.121 --> 00:49:07.440 award for senior postdocs looking

NOTE Confidence: 0.947299465

00:49:07.440 --> 00:49:09.880 to transition to faculty careers.

NOTE Confidence: 0.947299465

00:49:09.880 --> 00:49:11.880 Again, these are diversity focused.

NOTE Confidence: 0.947299465

00:49:11.880 --> 00:49:14.634 In the case of the K9 and Nine award,

NOTE Confidence: 0.947299465

00:49:14.640 --> 00:49:16.854 it is restricted for folks from
NOTE Confidence: 0.947299465

00:49:16.854 --> 00:49:18.330 underrepresented groups and unfortunately
NOTE Confidence: 0.947299465

00:49:18.382 --> 00:49:19.996 in the case of BRAIN initiative,
NOTE Confidence: 0.947299465

00:49:20.000 --> 00:49:21.200 this also includes women,
NOTE Confidence: 0.947299465

00:49:21.200 --> 00:49:23.000 but we're really trying to address
NOTE Confidence: 0.947299465

00:49:23.057 --> 00:49:24.357 that through these awards.
NOTE Confidence: 0.947299465

00:49:24.360 --> 00:49:26.115 We also issue administrative supplements
NOTE Confidence: 0.947299465

00:49:26.115 --> 00:49:28.650 to get folks into the pipeline who
NOTE Confidence: 0.947299465

00:49:28.650 --> 00:49:30.792 hopefully can be competitive for these
NOTE Confidence: 0.947299465

00:49:30.792 --> 00:49:32.759 these types of funding mechanisms
NOTE Confidence: 0.947299465

00:49:32.760 --> 00:49:33.772 additional sets of opportunities,
NOTE Confidence: 0.947299465

00:49:33.772 --> 00:49:36.400 I I'm not going to go through all these here,
NOTE Confidence: 0.947299465

00:49:36.400 --> 00:49:38.074 but there's AQR code and you can ask us,
NOTE Confidence: 0.947299465

00:49:38.080 --> 00:49:39.958 we can send you the information
NOTE Confidence: 0.947299465

00:49:39.958 --> 00:49:42.720 on that really to bring in a more
NOTE Confidence: 0.947299465

00:49:42.720 --> 00:49:44.160 diverse and strong workforce.

NOTE Confidence: 0.947299465

00:49:44.160 --> 00:49:45.078 So I left you I think,

NOTE Confidence: 0.947299465

00:49:45.080 --> 00:49:46.280 with three key takeaways.

NOTE Confidence: 0.947299465

00:49:46.280 --> 00:49:48.188 I lied, there's actually 4 takeaways.

NOTE Confidence: 0.947299465

00:49:48.188 --> 00:49:50.150 And that is it's really important

NOTE Confidence: 0.947299465

00:49:50.202 --> 00:49:51.237 for us all to build,

NOTE Confidence: 0.947299465

00:49:51.240 --> 00:49:53.865 continue building the momentum to

NOTE Confidence: 0.947299465

00:49:53.865 --> 00:49:56.490 bring cures for devastating human

NOTE Confidence: 0.947299465

00:49:56.575 --> 00:49:59.400 brain disorders within our lifetime.

NOTE Confidence: 0.947299465

00:49:59.400 --> 00:50:01.110 You can keep up to date on what we

NOTE Confidence: 0.947299465

00:50:01.110 --> 00:50:02.812 do in the BRAIN Initiative if you

NOTE Confidence: 0.947299465

00:50:02.812 --> 00:50:04.917 don't mind a few emails and your inbox

NOTE Confidence: 0.947299465

00:50:04.920 --> 00:50:07.123 through these different channels.

NOTE Confidence: 0.947299465

00:50:07.123 --> 00:50:09.301 And the most important channel for

NOTE Confidence: 0.947299465

00:50:09.301 --> 00:50:11.084 getting information if you're interested

NOTE Confidence: 0.947299465

00:50:11.084 --> 00:50:12.998 in BRAIN Initiative funding is to

NOTE Confidence: 0.947299465

00:50:12.998 --> 00:50:15.487 find us to find a program officer who

NOTE Confidence: 0.947299465

00:50:15.487 --> 00:50:17.294 overseas that program and to call.

NOTE Confidence: 0.947299465

00:50:17.294 --> 00:50:19.443 Call them because we really do enjoy

NOTE Confidence: 0.947299465

00:50:19.443 --> 00:50:21.298 talking to folks and seeing how

NOTE Confidence: 0.947299465

00:50:21.298 --> 00:50:23.289 we can align your interests with

NOTE Confidence: 0.947299465

00:50:23.289 --> 00:50:24.639 our funding opportunities.

NOTE Confidence: 0.947299465

00:50:24.640 --> 00:50:27.643 And you can find us@rain.gov and I

NOTE Confidence: 0.947299465

00:50:27.643 --> 00:50:30.999 will stop there and take any questions.