

WEBVTT

NOTE duration:"01:26:24"

NOTE recognizability:0.874

NOTE language:en-us

NOTE Confidence: 0.609593806

00:00:00.000 --> 00:00:03.540 No, no slides going old school.

NOTE Confidence: 0.609593806

00:00:03.540 --> 00:00:08.200 Oh, my goodness. All right.

NOTE Confidence: 0.609593806

00:00:08.200 --> 00:00:10.680 So welcome. I'm so glad you're here.

NOTE Confidence: 0.609593806

00:00:10.680 --> 00:00:11.835 And welcome to the folks who are

NOTE Confidence: 0.609593806

00:00:11.835 --> 00:00:13.159 here on the ZOOM meeting as well.

NOTE Confidence: 0.961225685

00:00:14.400 --> 00:00:15.280 So I think most

NOTE Confidence: 0.8402971875

00:00:15.280 --> 00:00:16.760 of you know, and I'm delighted you're here,

NOTE Confidence: 0.8402971875

00:00:16.760 --> 00:00:18.848 The, the program for Biomedical Ethics

NOTE Confidence: 0.8402971875

00:00:18.848 --> 00:00:21.159 and the Yale Pediatric Ethics Program,

NOTE Confidence: 0.8402971875

00:00:21.160 --> 00:00:23.080 we host an evening seminar twice a month.

NOTE Confidence: 0.8402971875

00:00:23.080 --> 00:00:24.560 There'll be one more before Christmas.

NOTE Confidence: 0.8402971875

00:00:24.560 --> 00:00:26.240 That's next week, in fact.

NOTE Confidence: 0.8402971875

00:00:26.240 --> 00:00:27.080 But tonight we have something

NOTE Confidence: 0.8402971875

00:00:27.080 --> 00:00:28.480 special and some of you are familiar  
NOTE Confidence: 0.8402971875

00:00:28.480 --> 00:00:30.116 with this work and some are not.  
NOTE Confidence: 0.8402971875

00:00:30.116 --> 00:00:31.560 I sent a note to you guys a couple  
NOTE Confidence: 0.924231702857143

00:00:31.560 --> 00:00:33.880 weeks ago about it a little bit, but  
NOTE Confidence: 0.916998682666667

00:00:33.880 --> 00:00:35.763 I had asked my colleague Steve Latham  
NOTE Confidence: 0.916998682666667

00:00:35.763 --> 00:00:37.840 to come and speak to us this fall.  
NOTE Confidence: 0.916998682666667

00:00:37.840 --> 00:00:42.564 Steve Latham it was is educated as an  
NOTE Confidence: 0.916998682666667

00:00:42.564 --> 00:00:43.776 attorney and a bioethicist to thinking  
NOTE Confidence: 0.916998682666667

00:00:43.776 --> 00:00:45.440 with the Harvard undergraduate as well as  
NOTE Confidence: 0.916998682666667

00:00:45.440 --> 00:00:49.070 the Harvard Medical School and has a PhD.  
NOTE Confidence: 0.916998682666667

00:00:49.070 --> 00:00:51.438 He's no medical school.  
NOTE Confidence: 0.916998682666667

00:00:51.440 --> 00:00:52.840 I can't believe I let you take out.  
NOTE Confidence: 0.916998682666667

00:00:52.840 --> 00:00:53.680 No, it was, it  
NOTE Confidence: 0.517552736666667

00:00:53.680 --> 00:00:54.760 was the law school I remember.  
NOTE Confidence: 0.926037835714286

00:00:56.280 --> 00:00:59.280 So he is an attorney and a philosopher  
NOTE Confidence: 0.926037835714286

00:00:59.280 --> 00:01:01.644 and is importantly very well known

NOTE Confidence: 0.926037835714286  
00:01:01.644 --> 00:01:04.799 in the world of health care ethics,  
NOTE Confidence: 0.926037835714286  
00:01:04.800 --> 00:01:06.024 has been very much involved in  
NOTE Confidence: 0.926037835714286  
00:01:06.024 --> 00:01:07.184 the American Society of Bioethics.  
NOTE Confidence: 0.926037835714286  
00:01:07.184 --> 00:01:09.710 He's a fellow of the Hastings  
NOTE Confidence: 0.926037835714286  
00:01:09.710 --> 00:01:11.920 Center and for us at Yale.  
NOTE Confidence: 0.926037835714286  
00:01:11.920 --> 00:01:13.383 He is also for several years now  
NOTE Confidence: 0.926037835714286  
00:01:13.383 --> 00:01:15.151 he's been the director of the  
NOTE Confidence: 0.926037835714286  
00:01:15.151 --> 00:01:16.626 Interdisciplinary Center for Bioethics.  
NOTE Confidence: 0.926037835714286  
00:01:16.626 --> 00:01:17.948 So you guys who have an interest  
NOTE Confidence: 0.926037835714286  
00:01:17.948 --> 00:01:18.958 in this stuff who may not be  
NOTE Confidence: 0.926037835714286  
00:01:18.960 --> 00:01:20.410 familiar with this, we have us,  
NOTE Confidence: 0.926037835714286  
00:01:20.410 --> 00:01:22.410 our sister program on the main campus and  
NOTE Confidence: 0.926037835714286  
00:01:22.410 --> 00:01:24.580 they host all sorts of various things,  
NOTE Confidence: 0.926037835714286  
00:01:24.580 --> 00:01:27.000 among others, a really amazing summer  
NOTE Confidence: 0.926037835714286  
00:01:27.000 --> 00:01:28.570 program which you can look into.  
NOTE Confidence: 0.926037835714286

00:01:28.570 --> 00:01:29.680 But if you just looked up,  
NOTE Confidence: 0.926037835714286

00:01:29.680 --> 00:01:30.920 you look up Yale Bioethics,  
NOTE Confidence: 0.926037835714286

00:01:30.920 --> 00:01:32.168 you'll see a link for us and  
NOTE Confidence: 0.926037835714286

00:01:32.168 --> 00:01:33.895 you'll also see a link for the  
NOTE Confidence: 0.926037835714286

00:01:33.895 --> 00:01:34.995 interdisciplinary Center for Bioethics.  
NOTE Confidence: 0.926037835714286

00:01:35.000 --> 00:01:36.576 Lots of lots of fascinating  
NOTE Confidence: 0.926037835714286

00:01:36.576 --> 00:01:37.560 offerings over there.  
NOTE Confidence: 0.926037835714286

00:01:37.560 --> 00:01:38.880 And so we do things back and forth,  
NOTE Confidence: 0.926037835714286

00:01:38.880 --> 00:01:40.080 we help each other out.  
NOTE Confidence: 0.926037835714286

00:01:40.080 --> 00:01:43.830 Steve is very well known teacher  
NOTE Confidence: 0.926037835714286

00:01:43.830 --> 00:01:45.280 specifically on the main campus.  
NOTE Confidence: 0.926037835714286

00:01:45.280 --> 00:01:46.235 He's taught a course in  
NOTE Confidence: 0.926037835714286

00:01:46.235 --> 00:01:46.999 bioethics there for years,  
NOTE Confidence: 0.926037835714286

00:01:47.000 --> 00:01:49.917 which has been either the most highly  
NOTE Confidence: 0.926037835714286

00:01:49.917 --> 00:01:52.410 subscribed course or one of the two or three  
NOTE Confidence: 0.926037835714286

00:01:52.474 --> 00:01:56.600 highly subscribed courses for many years now,

NOTE Confidence: 0.926037835714286  
00:01:56.600 --> 00:01:56.954 recently.  
NOTE Confidence: 0.926037835714286  
00:01:56.954 --> 00:01:59.078 And so Steve's come over here,  
NOTE Confidence: 0.926037835714286  
00:01:59.080 --> 00:02:00.277 I'd say at least once a year.  
NOTE Confidence: 0.926037835714286  
00:02:00.280 --> 00:02:01.270 He does one of these sessions  
NOTE Confidence: 0.926037835714286  
00:02:01.270 --> 00:02:02.600 for us and they're always great  
NOTE Confidence: 0.926037835714286  
00:02:02.600 --> 00:02:03.920 because he's a very gifted teacher,  
NOTE Confidence: 0.926037835714286  
00:02:03.920 --> 00:02:06.278 as you'll see.  
NOTE Confidence: 0.926037835714286  
00:02:06.280 --> 00:02:09.670 He also has IRB experience and through  
NOTE Confidence: 0.926037835714286  
00:02:09.670 --> 00:02:11.875 his work in terms of research ethics,  
NOTE Confidence: 0.926037835714286  
00:02:11.880 --> 00:02:13.200 he got involved in a project  
NOTE Confidence: 0.926037835714286  
00:02:13.200 --> 00:02:15.232 about live brain research which  
NOTE Confidence: 0.926037835714286  
00:02:15.232 --> 00:02:16.048 is absolutely fascinating.  
NOTE Confidence: 0.926037835714286  
00:02:16.048 --> 00:02:19.360 And some of you are familiar with this stuff.  
NOTE Confidence: 0.926037835714286  
00:02:19.360 --> 00:02:20.704 Some of you historians who are sitting  
NOTE Confidence: 0.926037835714286  
00:02:20.704 --> 00:02:22.055 in the French Revolution might find  
NOTE Confidence: 0.926037835714286

00:02:22.055 --> 00:02:23.280 some of this stuff fascinating.  
NOTE Confidence: 0.926037835714286

00:02:23.280 --> 00:02:24.535 I mean there's there's various  
NOTE Confidence: 0.926037835714286

00:02:24.535 --> 00:02:26.080 ways you can get into this.  
NOTE Confidence: 0.926037835714286

00:02:26.080 --> 00:02:28.300 But I I I wanted so much to  
NOTE Confidence: 0.926037835714286

00:02:28.300 --> 00:02:29.360 hear Steve speak about his  
NOTE Confidence: 0.899485684

00:02:29.360 --> 00:02:31.440 work on live Brain research. And so  
NOTE Confidence: 0.9016931075

00:02:32.040 --> 00:02:34.120 I'm going to tell you guys some numbers,  
NOTE Confidence: 0.9016931075

00:02:34.120 --> 00:02:36.412 which is the texting code for  
NOTE Confidence: 0.9016931075

00:02:36.412 --> 00:02:40.232 credit for this for CME is 40966  
NOTE Confidence: 0.9016931075

00:02:40.232 --> 00:02:42.080 out of town, please call collect  
NOTE Confidence: 0.948722416

00:02:44.160 --> 00:02:47.160 40966 to get CME credit.  
NOTE Confidence: 0.948722416

00:02:47.160 --> 00:02:48.398 We're going to do this the way we  
NOTE Confidence: 0.948722416

00:02:48.398 --> 00:02:49.760 usually do it, which is that Steve's  
NOTE Confidence: 0.948722416

00:02:49.760 --> 00:02:51.828 going to speak for about 45 minutes,  
NOTE Confidence: 0.948722416

00:02:51.828 --> 00:02:53.676 give or take a little bit.  
NOTE Confidence: 0.948722416

00:02:53.680 --> 00:02:55.874 And then after that we are going to

NOTE Confidence: 0.948722416

00:02:55.874 --> 00:02:57.176 have a conversation and I'm moderate

NOTE Confidence: 0.948722416

00:02:57.176 --> 00:02:58.837 and you guys can ask Steve questions,

NOTE Confidence: 0.948722416

00:02:58.840 --> 00:02:59.956 you can fight with each other.

NOTE Confidence: 0.948722416

00:02:59.960 --> 00:03:02.795 We can do all sorts of things until 6:30,

NOTE Confidence: 0.948722416

00:03:02.800 --> 00:03:05.142 at which point I will be wrapping it up,

NOTE Confidence: 0.948722416

00:03:05.142 --> 00:03:06.226 no matter how fascinating

NOTE Confidence: 0.948722416

00:03:06.226 --> 00:03:07.039 the conversation is.

NOTE Confidence: 0.948722416

00:03:07.040 --> 00:03:08.678 We'll close it off at 6:30.

NOTE Confidence: 0.948722416

00:03:08.680 --> 00:03:09.160 But until then,

NOTE Confidence: 0.948722416

00:03:09.160 --> 00:03:10.280 it's going to be a great evening.

NOTE Confidence: 0.948722416

00:03:10.280 --> 00:03:11.834 I thank you so much for coming.

NOTE Confidence: 0.948722416

00:03:11.840 --> 00:03:13.156 And I turn this over to my

NOTE Confidence: 0.948722416

00:03:13.156 --> 00:03:14.240 friend and my colleague,

NOTE Confidence: 0.948722416

00:03:14.240 --> 00:03:15.580 the director of the Interdisciplinary

NOTE Confidence: 0.948722416

00:03:15.580 --> 00:03:16.920 Center for Bioethics at Yale,

NOTE Confidence: 0.948722416

00:03:17.680 --> 00:03:18.480 Steve Latham.  
NOTE Confidence: 0.91340476

00:03:24.880 --> 00:03:26.246 Oh, thank you so much, Mark.  
NOTE Confidence: 0.91340476

00:03:26.246 --> 00:03:29.528 It's great to be here turning on my timer,  
NOTE Confidence: 0.91340476

00:03:29.528 --> 00:03:31.826 so I make sure I don't go too  
NOTE Confidence: 0.91340476

00:03:31.826 --> 00:03:32.891 long without giving you guys  
NOTE Confidence: 0.91340476

00:03:32.891 --> 00:03:34.240 a chance for some questions.  
NOTE Confidence: 0.91340476

00:03:34.240 --> 00:03:37.616 So I have to start with a couple  
NOTE Confidence: 0.91340476

00:03:37.616 --> 00:03:39.680 of mandatory disclosures.  
NOTE Confidence: 0.91340476

00:03:39.680 --> 00:03:41.704 I'm not a neurologist.  
NOTE Confidence: 0.91340476

00:03:41.704 --> 00:03:44.234 I'm not a neuroimaging expert.  
NOTE Confidence: 0.91340476

00:03:44.240 --> 00:03:47.640 I'm not even a neuroethicist.  
NOTE Confidence: 0.91340476

00:03:47.640 --> 00:03:50.664 So if you're here to learn about  
NOTE Confidence: 0.91340476

00:03:50.664 --> 00:03:52.694 a specialty area, you won't.  
NOTE Confidence: 0.91340476

00:03:52.694 --> 00:03:55.263 If you're here because you know everything  
NOTE Confidence: 0.91340476

00:03:55.263 --> 00:03:57.320 about neurology and neuroethics,  
NOTE Confidence: 0.91340476

00:03:57.320 --> 00:03:59.958 you will be hearing a non specialist



NOTE Confidence: 0.91340476

00:03:59.960 --> 00:04:01.356 dribbling his philosophical ideas

NOTE Confidence: 0.91340476

00:04:01.356 --> 00:04:03.969 over your field in a way that

NOTE Confidence: 0.91340476

00:04:03.969 --> 00:04:05.797 will undoubtedly be disappointed,

NOTE Confidence: 0.91340476

00:04:05.800 --> 00:04:06.913 disappointing to you.

NOTE Confidence: 0.91340476

00:04:06.913 --> 00:04:08.397 So you've been warned.

NOTE Confidence: 0.91340476

00:04:08.400 --> 00:04:08.808 Secondly,

NOTE Confidence: 0.91340476

00:04:08.808 --> 00:04:09.624 more importantly,

NOTE Confidence: 0.91340476

00:04:09.624 --> 00:04:12.480 I have a conflict of interest which

NOTE Confidence: 0.91340476

00:04:12.551 --> 00:04:14.799 is that I'm in an I'm an ethics

NOTE Confidence: 0.91340476

00:04:14.799 --> 00:04:18.480 advisor and a an equity holder

NOTE Confidence: 0.91340476

00:04:18.480 --> 00:04:21.063 of Bexorg LLC which is a Yale

NOTE Confidence: 0.91340476

00:04:21.063 --> 00:04:23.141 spin off company that originated

NOTE Confidence: 0.91340476

00:04:23.141 --> 00:04:26.235 in the Ceston neural lab at the

NOTE Confidence: 0.91340476

00:04:26.235 --> 00:04:28.960 medical school that is trying to

NOTE Confidence: 0.91340476

00:04:28.960 --> 00:04:31.100 commercialize some of the techniques

NOTE Confidence: 0.91340476

00:04:31.100 --> 00:04:33.620 that I'll be describing in the  
NOTE Confidence: 0.91340476

00:04:33.620 --> 00:04:36.119 last and largest part of my talk.  
NOTE Confidence: 0.91340476

00:04:36.120 --> 00:04:39.600 So I want to make money off this.  
NOTE Confidence: 0.91340476

00:04:39.600 --> 00:04:43.720 So don't believe a word I say. OK.  
NOTE Confidence: 0.91340476

00:04:43.720 --> 00:04:46.558 So having given you those warnings,  
NOTE Confidence: 0.91340476

00:04:46.560 --> 00:04:49.557 let me tell you how this talk is organized.  
NOTE Confidence: 0.91340476

00:04:49.560 --> 00:04:52.320 OK, first, I mean,  
NOTE Confidence: 0.91340476

00:04:52.320 --> 00:04:55.200 I I'm going to kind of do a very,  
NOTE Confidence: 0.91340476

00:04:55.200 --> 00:04:57.629 very fast overview of what I think  
NOTE Confidence: 0.91340476

00:04:57.629 --> 00:05:00.456 of as main issues in the general  
NOTE Confidence: 0.91340476

00:05:00.456 --> 00:05:03.006 field of neuroethics that have to  
NOTE Confidence: 0.91340476

00:05:03.086 --> 00:05:05.558 do with research on live brains,  
NOTE Confidence: 0.91340476

00:05:05.560 --> 00:05:07.336 including research on brains  
NOTE Confidence: 0.91340476

00:05:07.336 --> 00:05:11.280 that are in live humans, OK.  
NOTE Confidence: 0.91340476

00:05:11.280 --> 00:05:13.674 And then I will turn to the Bexorg work,  
NOTE Confidence: 0.91340476

00:05:13.680 --> 00:05:16.326 which is actually on brains that

NOTE Confidence: 0.91340476

00:05:16.326 --> 00:05:19.560 are not in live people anymore,

NOTE Confidence: 0.91340476

00:05:19.560 --> 00:05:21.635 but that are nonetheless live

NOTE Confidence: 0.91340476

00:05:21.635 --> 00:05:24.560 in ways that I will describe.

NOTE Confidence: 0.91340476

00:05:24.560 --> 00:05:26.954 OK, so the plot of the talk is this.

NOTE Confidence: 0.91340476

00:05:26.960 --> 00:05:29.336 First I'm gonna give an opening

NOTE Confidence: 0.91340476

00:05:29.336 --> 00:05:31.235 section which basically says neuro

NOTE Confidence: 0.91340476

00:05:31.235 --> 00:05:33.440 research on live brains is just like

NOTE Confidence: 0.91340476

00:05:33.440 --> 00:05:35.958 all the other research on live folks,

NOTE Confidence: 0.91340476

00:05:35.960 --> 00:05:39.320 raising all the same basic issues.

NOTE Confidence: 0.91340476

00:05:39.320 --> 00:05:41.600 And I'll explain what I mean by that.

NOTE Confidence: 0.91340476

00:05:41.600 --> 00:05:44.000 And then there's a Part B,

NOTE Confidence: 0.91340476

00:05:44.000 --> 00:05:47.968 which is except when it isn't,

NOTE Confidence: 0.91340476

00:05:47.968 --> 00:05:48.520 OK,

NOTE Confidence: 0.91340476

00:05:48.520 --> 00:05:50.600 which is going to be some of the

NOTE Confidence: 0.91340476

00:05:50.600 --> 00:05:52.431 things that make neuro ethics and

NOTE Confidence: 0.91340476

00:05:52.431 --> 00:05:54.309 live brain research and neuro a  
NOTE Confidence: 0.91340476

00:05:54.371 --> 00:05:56.206 little bit different from other  
NOTE Confidence: 0.91340476

00:05:56.206 --> 00:05:57.674 kinds of medical ethics.  
NOTE Confidence: 0.91340476

00:05:57.680 --> 00:06:00.693 And then I'm going to turn to  
NOTE Confidence: 0.91340476

00:06:00.693 --> 00:06:03.304 the work that the Ceston lab and  
NOTE Confidence: 0.91340476

00:06:03.304 --> 00:06:05.598 Bexorg LLC have been doing on  
NOTE Confidence: 0.91340476

00:06:05.600 --> 00:06:07.718 live brains that are ex vivo.  
NOTE Confidence: 0.9218124

00:06:10.400 --> 00:06:15.535 So why is a lot of neuro live  
NOTE Confidence: 0.9218124

00:06:15.535 --> 00:06:18.319 brain work mostly very like?  
NOTE Confidence: 0.9218124

00:06:18.320 --> 00:06:20.588 What? Why are the ethics issues  
NOTE Confidence: 0.9218124

00:06:20.588 --> 00:06:22.519 associated with neuro live brain  
NOTE Confidence: 0.9218124

00:06:22.519 --> 00:06:24.249 work mostly like ethics issues  
NOTE Confidence: 0.9218124

00:06:24.249 --> 00:06:26.680 in lots of other research areas?  
NOTE Confidence: 0.9218124

00:06:26.680 --> 00:06:27.796 I'll give you a few examples.  
NOTE Confidence: 0.9218124

00:06:27.800 --> 00:06:31.188 Number one, animal ethics issues, right?  
NOTE Confidence: 0.9218124

00:06:31.188 --> 00:06:35.196 Neuro uses regularly mice and rats,

NOTE Confidence: 0.9218124

00:06:35.200 --> 00:06:39.170 zebrafish for certain kinds of work

NOTE Confidence: 0.9218124

00:06:39.170 --> 00:06:41.120 where you require a sophisticated brain,

NOTE Confidence: 0.9218124

00:06:41.120 --> 00:06:43.600 non human primates for work,

NOTE Confidence: 0.9218124

00:06:43.600 --> 00:06:46.183 where you need a really good model of how

NOTE Confidence: 0.9218124

00:06:46.183 --> 00:06:48.838 the human brain responds to trauma pigs.

NOTE Confidence: 0.9218124

00:06:48.840 --> 00:06:50.750 So pigs do a lot of a lot of head

NOTE Confidence: 0.9218124

00:06:50.814 --> 00:06:52.440 trauma work is done on pigs.

NOTE Confidence: 0.9218124

00:06:52.440 --> 00:06:53.400 And you know

NOTE Confidence: 0.952534320333333

00:06:58.760 --> 00:07:00.860 all of the animal ethics issues

NOTE Confidence: 0.952534320333333

00:07:00.860 --> 00:07:03.554 that are raised in all other kinds

NOTE Confidence: 0.952534320333333

00:07:03.554 --> 00:07:05.990 of animal ethics research for for

NOTE Confidence: 0.952534320333333

00:07:05.990 --> 00:07:08.294 medicine are raised in the neuro

NOTE Confidence: 0.952534320333333

00:07:08.294 --> 00:07:10.617 context and they're not that different.

NOTE Confidence: 0.952534320333333

00:07:10.617 --> 00:07:14.593 If neuro is maybe a little bit harder,

NOTE Confidence: 0.952534320333333

00:07:14.600 --> 00:07:16.658 it's because some of the things

NOTE Confidence: 0.952534320333333

00:07:16.658 --> 00:07:18.780 that neuro folks are trying to  
NOTE Confidence: 0.952534320333333  
00:07:18.780 --> 00:07:20.832 map in their live brain research  
NOTE Confidence: 0.952534320333333  
00:07:20.832 --> 00:07:23.238 require a more sophisticated brain.  
NOTE Confidence: 0.952534320333333  
00:07:23.240 --> 00:07:24.760 So you can't do it with a zebrafish.  
NOTE Confidence: 0.952534320333333  
00:07:24.760 --> 00:07:27.190 You have to do it with you have to do  
NOTE Confidence: 0.952534320333333  
00:07:27.261 --> 00:07:29.313 your Parkinson's model or your stroke  
NOTE Confidence: 0.952534320333333  
00:07:29.313 --> 00:07:32.230 model in a non human primate or you have  
NOTE Confidence: 0.952534320333333  
00:07:32.230 --> 00:07:36.520 to do your brain trauma model in a pig.  
NOTE Confidence: 0.932895940833333  
00:07:40.120 --> 00:07:42.570 I have to say, and I've written  
NOTE Confidence: 0.932895940833333  
00:07:42.570 --> 00:07:44.559 a very little about this,  
NOTE Confidence: 0.932895940833333  
00:07:44.560 --> 00:07:47.557 I think we do way too much animal research.  
NOTE Confidence: 0.932895940833333  
00:07:47.560 --> 00:07:50.178 I'm very much more hesitant than the  
NOTE Confidence: 0.932895940833333  
00:07:50.178 --> 00:07:52.523 average person who approves of animal  
NOTE Confidence: 0.932895940833333  
00:07:52.523 --> 00:07:57.079 research at all about animal research.  
NOTE Confidence: 0.932895940833333  
00:07:57.080 --> 00:07:59.464 I am very worried about the FDA standard  
NOTE Confidence: 0.932895940833333  
00:07:59.464 --> 00:08:01.461 that says we need results in animals

NOTE Confidence: 0.932895940833333  
00:08:01.461 --> 00:08:03.639 before we go on to human trials.  
NOTE Confidence: 0.932895940833333  
00:08:03.640 --> 00:08:05.038 Because, guess what, it doesn't work.  
NOTE Confidence: 0.932895940833333  
00:08:05.040 --> 00:08:08.076 Because most human trials for drugs  
NOTE Confidence: 0.932895940833333  
00:08:08.080 --> 00:08:10.036 come to the FDA with excellent  
NOTE Confidence: 0.932895940833333  
00:08:10.036 --> 00:08:12.000 animal evidence and then they fail,  
NOTE Confidence: 0.932895940833333  
00:08:12.000 --> 00:08:13.108 even at phase one,  
NOTE Confidence: 0.932895940833333  
00:08:13.108 --> 00:08:14.493 and they've almost none of  
NOTE Confidence: 0.932895940833333  
00:08:14.493 --> 00:08:16.157 them get through phase three.  
NOTE Confidence: 0.932895940833333  
00:08:16.160 --> 00:08:17.180 And that means the animal  
NOTE Confidence: 0.932895940833333  
00:08:17.180 --> 00:08:17.996 models are not working.  
NOTE Confidence: 0.932895940833333  
00:08:18.000 --> 00:08:19.862 And they're all kinds of good reasons  
NOTE Confidence: 0.932895940833333  
00:08:19.862 --> 00:08:21.839 why the animal models aren't working.  
NOTE Confidence: 0.932895940833333  
00:08:21.840 --> 00:08:24.558 We do it on all mice of the same  
NOTE Confidence: 0.932895940833333  
00:08:24.558 --> 00:08:27.116 gender from the same little colony,  
NOTE Confidence: 0.932895940833333  
00:08:27.120 --> 00:08:28.998 and mice aren't like us in  
NOTE Confidence: 0.932895940833333

00:08:28.998 --> 00:08:30.720 many ways anyway and so on.  
NOTE Confidence: 0.932895940833333

00:08:30.720 --> 00:08:32.928 And I think we waste a lot of  
NOTE Confidence: 0.932895940833333

00:08:32.928 --> 00:08:35.114 animals and I think it's really an  
NOTE Confidence: 0.932895940833333

00:08:35.114 --> 00:08:36.758 area where we need massive reform.  
NOTE Confidence: 0.932895940833333

00:08:36.760 --> 00:08:40.085 But none the less I think that  
NOTE Confidence: 0.932895940833333

00:08:40.085 --> 00:08:42.018 in neuroscience some use of  
NOTE Confidence: 0.932895940833333

00:08:42.018 --> 00:08:42.996 animals is justified.  
NOTE Confidence: 0.932895940833333

00:08:43.000 --> 00:08:44.864 And I'll say a little bit more about  
NOTE Confidence: 0.932895940833333

00:08:44.864 --> 00:08:46.920 that later when we get to talking  
NOTE Confidence: 0.932895940833333

00:08:46.920 --> 00:08:50.772 about the postmortem brain issue  
NOTE Confidence: 0.932895940833333

00:08:50.772 --> 00:08:55.116 with with Siston Lab and Bexorg.  
NOTE Confidence: 0.932895940833333

00:08:55.120 --> 00:08:57.200 Second,  
NOTE Confidence: 0.932895940833333

00:08:57.200 --> 00:08:59.797 another category in which a lot of  
NOTE Confidence: 0.932895940833333

00:08:59.797 --> 00:09:01.699 research in neurosciences on live  
NOTE Confidence: 0.932895940833333

00:09:01.699 --> 00:09:03.877 brains resembles other kinds of humans,  
NOTE Confidence: 0.932895940833333

00:09:03.880 --> 00:09:07.120 other kinds of research is human subjects,



NOTE Confidence: 0.932895940833333

00:09:07.120 --> 00:09:07.540 right.

NOTE Confidence: 0.932895940833333

00:09:07.540 --> 00:09:10.060 We've got some very well known

NOTE Confidence: 0.932895940833333

00:09:10.060 --> 00:09:11.879 standards for informed consent

NOTE Confidence: 0.932895940833333

00:09:11.880 --> 00:09:13.776 with human subjects research,

NOTE Confidence: 0.932895940833333

00:09:13.776 --> 00:09:15.968 I would say, you know,

NOTE Confidence: 0.932895940833333

00:09:15.968 --> 00:09:17.888 so it's not that different

NOTE Confidence: 0.932895940833333

00:09:17.888 --> 00:09:19.800 for live brain research.

NOTE Confidence: 0.932895940833333

00:09:19.800 --> 00:09:21.924 Humans consent to what?

NOTE Confidence: 0.932895940833333

00:09:21.924 --> 00:09:23.851 They're supposed to what?

NOTE Confidence: 0.932895940833333

00:09:23.851 --> 00:09:25.837 What will be happening to them.

NOTE Confidence: 0.932895940833333

00:09:25.840 --> 00:09:26.960 They're supposed to understand

NOTE Confidence: 0.932895940833333

00:09:26.960 --> 00:09:27.800 risks and benefits.

NOTE Confidence: 0.932895940833333

00:09:27.800 --> 00:09:29.354 And IRB is supposed to have made

NOTE Confidence: 0.8245494025

00:09:32.440 --> 00:09:33.995 balancing choices about risks and

NOTE Confidence: 0.8245494025

00:09:33.995 --> 00:09:35.970 benefits and is supposed to have

NOTE Confidence: 0.8245494025

00:09:35.970 --> 00:09:37.795 approved the informed consent process.  
NOTE Confidence: 0.8245494025

00:09:37.800 --> 00:09:39.915 I was going to say it's not brain surgery,  
NOTE Confidence: 0.8245494025

00:09:39.920 --> 00:09:41.957 except that in many cases it is.  
NOTE Confidence: 0.8245494025

00:09:41.960 --> 00:09:44.252 So I'm going to say it's  
NOTE Confidence: 0.8245494025

00:09:44.252 --> 00:09:45.800 not rocket surgery. OK,  
NOTE Confidence: 0.81016296

00:09:48.680 --> 00:09:53.184 so and there are many examples of  
NOTE Confidence: 0.81016296

00:09:53.184 --> 00:09:54.800 these totally mainstream ethics  
NOTE Confidence: 0.81016296

00:09:54.869 --> 00:09:56.759 issues in live brain surgery,  
NOTE Confidence: 0.81016296

00:09:56.760 --> 00:09:59.042 but we don't, we shouldn't treat them  
NOTE Confidence: 0.81016296

00:09:59.042 --> 00:10:00.999 any differently than we treat parallel  
NOTE Confidence: 0.81016296

00:10:00.999 --> 00:10:02.835 issues in in in cancer surgery.  
NOTE Confidence: 0.81016296

00:10:02.840 --> 00:10:05.640 So for example, right now Lori Bruce,  
NOTE Confidence: 0.81016296

00:10:05.640 --> 00:10:08.160 my colleague at the Interdisciplinary Center,  
NOTE Confidence: 0.81016296

00:10:08.160 --> 00:10:12.375 and a colleague of ours from  
NOTE Confidence: 0.81016296

00:10:12.375 --> 00:10:14.212 Oxford University, Brian Earp,  
NOTE Confidence: 0.81016296

00:10:14.212 --> 00:10:17.075 have been working on this problem with

NOTE Confidence: 0.81016296

00:10:17.075 --> 00:10:19.880 a lot of psychedelic studies in the

NOTE Confidence: 0.81016296

00:10:19.880 --> 00:10:22.960 brains of living people who have PTSD.

NOTE Confidence: 0.81016296

00:10:22.960 --> 00:10:26.264 There seems to have been a kind

NOTE Confidence: 0.81016296

00:10:26.264 --> 00:10:28.724 of systematic problem of not

NOTE Confidence: 0.81016296

00:10:28.724 --> 00:10:30.320 reporting unanticipated

NOTE Confidence: 0.94110727

00:10:34.240 --> 00:10:37.048 adverse events in association with those

NOTE Confidence: 0.94110727

00:10:37.048 --> 00:10:38.750 trials. Harms are not being reported

NOTE Confidence: 0.94110727

00:10:38.750 --> 00:10:40.440 and then when they're not reported,

NOTE Confidence: 0.94110727

00:10:40.440 --> 00:10:43.500 they're not being disclosed to new subjects

NOTE Confidence: 0.94110727

00:10:43.500 --> 00:10:47.560 in the in the informed consent findings.

NOTE Confidence: 0.94110727

00:10:47.560 --> 00:10:49.384 But the way you address that is exactly

NOTE Confidence: 0.94110727

00:10:49.384 --> 00:10:51.280 the same way that you would address a

NOTE Confidence: 0.94110727

00:10:51.280 --> 00:10:53.122 similar problem in a cancer trial, right?

NOTE Confidence: 0.94110727

00:10:53.122 --> 00:10:55.058 You try to reform the kinds of things

NOTE Confidence: 0.94110727

00:10:55.058 --> 00:10:57.010 that people report and you try to reform

NOTE Confidence: 0.94110727

00:10:57.010 --> 00:10:58.836 the kinds of things that people ask  
NOTE Confidence: 0.94110727

00:10:58.836 --> 00:11:02.840 about in the course of informed consent.  
NOTE Confidence: 0.94110727

00:11:02.840 --> 00:11:05.640 Another couple of big kind of brain live,  
NOTE Confidence: 0.94110727

00:11:05.640 --> 00:11:08.280 brain study issues that arise,  
NOTE Confidence: 0.94110727

00:11:08.280 --> 00:11:10.554 but they arrive in they arise  
NOTE Confidence: 0.94110727

00:11:10.554 --> 00:11:12.560 in other areas as well.  
NOTE Confidence: 0.94110727

00:11:12.560 --> 00:11:16.960 The problem of predictive diagnosis.  
NOTE Confidence: 0.94110727

00:11:16.960 --> 00:11:20.700 Very often people who study brains,  
NOTE Confidence: 0.94110727

00:11:20.700 --> 00:11:22.725 if they're studying them using  
NOTE Confidence: 0.94110727

00:11:22.725 --> 00:11:24.998 genetic tools or even imaging tools,  
NOTE Confidence: 0.94110727

00:11:25.000 --> 00:11:27.590 they can come up with predictions about  
NOTE Confidence: 0.94110727

00:11:27.590 --> 00:11:29.839 brain diseases that someone might be,  
NOTE Confidence: 0.94110727

00:11:29.840 --> 00:11:33.692 that that someone is more apt to suffer  
NOTE Confidence: 0.94110727

00:11:33.692 --> 00:11:36.560 from than someone in the general population,  
NOTE Confidence: 0.94110727

00:11:36.560 --> 00:11:38.320 even though they're asymptomatic  
NOTE Confidence: 0.94110727

00:11:38.320 --> 00:11:39.640 at the moment.

NOTE Confidence: 0.94110727

00:11:39.640 --> 00:11:42.022 This raises lots of issues in

NOTE Confidence: 0.94110727

00:11:42.022 --> 00:11:44.360 particular can be quite dramatic,

NOTE Confidence: 0.94110727

00:11:44.360 --> 00:11:46.859 traumatic for people to be informed that

NOTE Confidence: 0.94110727

00:11:46.859 --> 00:11:49.594 they are at risk for certain disease

NOTE Confidence: 0.94110727

00:11:49.594 --> 00:11:52.400 where there's no treatment and no cure.

NOTE Confidence: 0.94110727

00:11:52.400 --> 00:11:54.158 But this is not a problem.

NOTE Confidence: 0.94110727

00:11:54.160 --> 00:11:54.654 That's again,

NOTE Confidence: 0.94110727

00:11:54.654 --> 00:11:56.136 it's not a problem that's unique

NOTE Confidence: 0.94110727

00:11:56.136 --> 00:11:57.040 to brain science.

NOTE Confidence: 0.94110727

00:11:57.040 --> 00:11:59.707 It's a problem that is exists across

NOTE Confidence: 0.94110727

00:11:59.707 --> 00:12:02.667 the board and it shows up particularly

NOTE Confidence: 0.94110727

00:12:02.667 --> 00:12:05.591 in every field that uses imaging and

NOTE Confidence: 0.94110727

00:12:05.591 --> 00:12:08.079 you and there's a a parallel issue here

NOTE Confidence: 0.94110727

00:12:08.079 --> 00:12:10.676 which has to do with incidental findings.

NOTE Confidence: 0.94110727

00:12:10.680 --> 00:12:14.851 You you can find some some traits that

NOTE Confidence: 0.94110727

00:12:14.851 --> 00:12:17.353 people have that are not actionable.  
NOTE Confidence: 0.94110727

00:12:17.360 --> 00:12:20.272 You can find other traits that people have  
NOTE Confidence: 0.94110727

00:12:20.272 --> 00:12:23.360 that you don't quite know what they mean.  
NOTE Confidence: 0.94110727

00:12:23.360 --> 00:12:24.560 There's something abnormal  
NOTE Confidence: 0.94110727

00:12:24.560 --> 00:12:25.808 in the person's body,  
NOTE Confidence: 0.94110727

00:12:25.808 --> 00:12:27.600 but you have no idea what it means.  
NOTE Confidence: 0.94110727

00:12:27.600 --> 00:12:29.805 And then you're going down the road  
NOTE Confidence: 0.94110727

00:12:29.805 --> 00:12:31.786 toward lots of additional tests and  
NOTE Confidence: 0.94110727

00:12:31.786 --> 00:12:34.493 a lot of uncertainty and a lot of  
NOTE Confidence: 0.94110727

00:12:34.493 --> 00:12:36.708 worry because something cropped up on  
NOTE Confidence: 0.94110727

00:12:36.708 --> 00:12:38.852 an image that you were doing for one  
NOTE Confidence: 0.94110727

00:12:38.852 --> 00:12:42.277 reason that might be relevant to other stuff.  
NOTE Confidence: 0.94110727

00:12:42.280 --> 00:12:44.410 And very often we don't adequately  
NOTE Confidence: 0.94110727

00:12:44.410 --> 00:12:46.494 inform people about the risks that  
NOTE Confidence: 0.94110727

00:12:46.494 --> 00:12:48.894 some kinds of imaging or some kinds of  
NOTE Confidence: 0.94110727

00:12:48.956 --> 00:12:51.038 tests might inform them about things

NOTE Confidence: 0.94110727

00:12:51.038 --> 00:12:55.440 that we really don't know what to do about.

NOTE Confidence: 0.94110727

00:12:55.440 --> 00:12:55.964 But again,

NOTE Confidence: 0.94110727

00:12:55.964 --> 00:12:57.798 that's not a brain science specific problem.

NOTE Confidence: 0.94110727

00:12:57.800 --> 00:13:00.544 That's a problem that we get in

NOTE Confidence: 0.94110727

00:13:00.544 --> 00:13:03.411 lots of different kinds of medical

NOTE Confidence: 0.94110727

00:13:03.411 --> 00:13:05.559 research and medical practice.

NOTE Confidence: 0.94110727

00:13:05.560 --> 00:13:07.394 And there is growing wisdom on this.

NOTE Confidence: 0.94110727

00:13:07.400 --> 00:13:10.599 Lots has been written about how to

NOTE Confidence: 0.94110727

00:13:10.599 --> 00:13:13.518 handle the incidental findings issue and

NOTE Confidence: 0.94110727

00:13:13.520 --> 00:13:15.074 we can talk about this in discussion,

NOTE Confidence: 0.94110727

00:13:15.080 --> 00:13:16.946 but I I commend you to

NOTE Confidence: 0.94110727

00:13:16.946 --> 00:13:17.879 that growing literature.

NOTE Confidence: 0.94110727

00:13:17.880 --> 00:13:20.224 The point is that it's a thing that

NOTE Confidence: 0.94110727

00:13:20.224 --> 00:13:22.518 shows up in a lot of brain studies

NOTE Confidence: 0.94110727

00:13:22.518 --> 00:13:24.642 because we do a lot of imaging of

NOTE Confidence: 0.94110727

00:13:24.642 --> 00:13:26.609 brains and you could come up with  
NOTE Confidence: 0.94110727

00:13:26.609 --> 00:13:28.398 something that looks a little unusual,  
NOTE Confidence: 0.94110727

00:13:28.400 --> 00:13:29.960 doesn't quite look like a tumor.  
NOTE Confidence: 0.94110727

00:13:29.960 --> 00:13:31.560 Is that a blockage? Right.  
NOTE Confidence: 0.94110727

00:13:31.560 --> 00:13:33.424 And you know what?  
NOTE Confidence: 0.94110727

00:13:33.424 --> 00:13:35.754 You do imaging on anyone,  
NOTE Confidence: 0.94110727

00:13:35.760 --> 00:13:37.587 and you will come up with all  
NOTE Confidence: 0.94110727

00:13:37.587 --> 00:13:38.370 kinds of unusual  
NOTE Confidence: 0.943182836666667

00:13:38.428 --> 00:13:39.988 findings that are not causing  
NOTE Confidence: 0.943182836666667

00:13:39.988 --> 00:13:41.874 any symptoms and that you will  
NOTE Confidence: 0.943182836666667

00:13:41.874 --> 00:13:43.476 need to explain and work on.  
NOTE Confidence: 0.943182836666667

00:13:43.480 --> 00:13:46.318 And it's burdensome and it's expensive.  
NOTE Confidence: 0.943182836666667

00:13:46.320 --> 00:13:48.084 And if you haven't informed people  
NOTE Confidence: 0.943182836666667

00:13:48.084 --> 00:13:50.280 of the risk of that in advance,  
NOTE Confidence: 0.943182836666667

00:13:50.280 --> 00:13:53.320 you're doing something wrong. OK.  
NOTE Confidence: 0.97669834

00:13:56.640 --> 00:14:01.720 Another another thing that live



NOTE Confidence: 0.97669834

00:14:01.720 --> 00:14:04.360 brain research and here I'm thinking

NOTE Confidence: 0.97669834

00:14:04.360 --> 00:14:06.280 particularly of emergency research

NOTE Confidence: 0.97669834

00:14:06.280 --> 00:14:08.644 has in common with many other

NOTE Confidence: 0.97669834

00:14:08.644 --> 00:14:11.355 fields is the problem of holding

NOTE Confidence: 0.97669834

00:14:11.355 --> 00:14:14.320 out the prospect of life saving

NOTE Confidence: 0.8367966833333333

00:14:16.400 --> 00:14:19.544 but creating a a very low

NOTE Confidence: 0.8367966833333333

00:14:19.544 --> 00:14:21.352 quality of life, right.

NOTE Confidence: 0.8367966833333333

00:14:21.352 --> 00:14:24.306 So when we learned, for example,

NOTE Confidence: 0.8367966833333333

00:14:24.306 --> 00:14:27.148 that cooling off a traumatically

NOTE Confidence: 0.8367966833333333

00:14:27.148 --> 00:14:30.136 injured brain in the Ed could reduce

NOTE Confidence: 0.8367966833333333

00:14:30.136 --> 00:14:31.876 brain swelling and could save

NOTE Confidence: 0.8367966833333333

00:14:31.876 --> 00:14:34.114 some people from dying from the

NOTE Confidence: 0.8367966833333333

00:14:34.114 --> 00:14:35.994 swelling pressure against the skull.

NOTE Confidence: 0.8367966833333333

00:14:36.000 --> 00:14:37.930 When we learned that lots

NOTE Confidence: 0.8367966833333333

00:14:37.930 --> 00:14:39.474 of lives were saved,

NOTE Confidence: 0.8367966833333333

00:14:39.480 --> 00:14:40.866 but the lives that were saved  
NOTE Confidence: 0.8367966833333333

00:14:40.866 --> 00:14:42.614 were lives of people who had just  
NOTE Confidence: 0.8367966833333333

00:14:42.614 --> 00:14:43.899 gone through a traumatic brain  
NOTE Confidence: 0.8367966833333333

00:14:43.899 --> 00:14:46.716 injury and many of them were saved  
NOTE Confidence: 0.8367966833333333

00:14:46.716 --> 00:14:49.424 only to be profoundly disabled,  
NOTE Confidence: 0.8367966833333333

00:14:49.424 --> 00:14:51.914 including mentally disabled, right.  
NOTE Confidence: 0.8367966833333333

00:14:51.914 --> 00:14:54.392 So in every kind of cutting edge  
NOTE Confidence: 0.8367966833333333

00:14:54.392 --> 00:14:57.027 piece of research we have this issue  
NOTE Confidence: 0.8367966833333333

00:14:57.027 --> 00:15:01.194 of whether a new technology might be  
NOTE Confidence: 0.8367966833333333

00:15:01.194 --> 00:15:03.553 advantageous in terms of life saving terms,  
NOTE Confidence: 0.8367966833333333

00:15:03.560 --> 00:15:07.292 but that might might leave the  
NOTE Confidence: 0.8367966833333333

00:15:07.292 --> 00:15:09.250 patients very unhappy and also in  
NOTE Confidence: 0.8367966833333333

00:15:09.250 --> 00:15:11.612 a in a place where they need very  
NOTE Confidence: 0.8367966833333333

00:15:11.612 --> 00:15:13.866 expensive care or where they put huge  
NOTE Confidence: 0.8367966833333333

00:15:13.930 --> 00:15:16.156 demands on their families and so on.  
NOTE Confidence: 0.8367966833333333

00:15:16.160 --> 00:15:17.466 But again,

NOTE Confidence: 0.8367966833333333

00:15:17.466 --> 00:15:22.037 this is not unique to brain sciences.

NOTE Confidence: 0.8367966833333333

00:15:22.040 --> 00:15:24.115 Another thing that's not unique

NOTE Confidence: 0.8367966833333333

00:15:24.115 --> 00:15:25.360 to brain sciences,

NOTE Confidence: 0.8367966833333333

00:15:25.360 --> 00:15:28.040 the treatment versus enhancement distinction.

NOTE Confidence: 0.909457062857143

00:15:32.240 --> 00:15:34.480 You know, you can give someone Aricept

NOTE Confidence: 0.909457062857143

00:15:34.480 --> 00:15:36.910 who's got Alzheimer's and that will

NOTE Confidence: 0.909457062857143

00:15:36.910 --> 00:15:39.080 improve their short term memory.

NOTE Confidence: 0.909457062857143

00:15:39.080 --> 00:15:41.618 It'll help them hold on to a few more

NOTE Confidence: 0.909457062857143

00:15:41.618 --> 00:15:44.075 facts for the time that they're on it.

NOTE Confidence: 0.909457062857143

00:15:44.080 --> 00:15:45.886 But I'm sure no one in this

NOTE Confidence: 0.909457062857143

00:15:45.886 --> 00:15:47.320 room knows anything about this.

NOTE Confidence: 0.909457062857143

00:15:47.320 --> 00:15:50.029 But it has been rumoured that the

NOTE Confidence: 0.909457062857143

00:15:50.029 --> 00:15:51.994 occasional medical student has taken

NOTE Confidence: 0.909457062857143

00:15:51.994 --> 00:15:55.910 Aricept just before an exam because

NOTE Confidence: 0.909457062857143

00:15:55.910 --> 00:15:58.060 it is actually attention enhancing

NOTE Confidence: 0.909457062857143

00:15:58.060 --> 00:16:00.956 and allows you to really focus even  
NOTE Confidence: 0.909457062857143

00:16:00.956 --> 00:16:03.605 when you're tired and so on, right?  
NOTE Confidence: 0.909457062857143

00:16:03.605 --> 00:16:07.165 So many of the very same kinds of  
NOTE Confidence: 0.909457062857143

00:16:07.165 --> 00:16:09.408 interventions that treat people can  
NOTE Confidence: 0.909457062857143

00:16:09.408 --> 00:16:12.570 also enhance people and make them  
NOTE Confidence: 0.909457062857143

00:16:12.570 --> 00:16:14.760 perform they're they're perfectly fine,  
NOTE Confidence: 0.909457062857143

00:16:14.760 --> 00:16:16.810 but the treatment causes them  
NOTE Confidence: 0.909457062857143

00:16:16.810 --> 00:16:19.388 to perform it a little bit more  
NOTE Confidence: 0.909457062857143

00:16:19.388 --> 00:16:20.986 than perfectly fine, right?  
NOTE Confidence: 0.909457062857143

00:16:20.986 --> 00:16:24.808 And we have endless debate about the  
NOTE Confidence: 0.909457062857143

00:16:24.808 --> 00:16:26.992 treatment enhancement line, right?  
NOTE Confidence: 0.909457062857143

00:16:26.992 --> 00:16:30.256 We give growth hormone to children  
NOTE Confidence: 0.909457062857143

00:16:30.256 --> 00:16:32.998 of unusually short stature,  
NOTE Confidence: 0.909457062857143

00:16:33.000 --> 00:16:34.755 but we don't give growth  
NOTE Confidence: 0.909457062857143

00:16:34.755 --> 00:16:36.159 hormone to ordinary kids,  
NOTE Confidence: 0.909457062857143

00:16:36.160 --> 00:16:38.266 so they can grow up to be 6 foot

NOTE Confidence: 0.909457062857143

00:16:38.266 --> 00:16:40.296 6 basketball players, right?

NOTE Confidence: 0.909457062857143

00:16:40.296 --> 00:16:42.376 The very same treatment that

NOTE Confidence: 0.909457062857143

00:16:42.376 --> 00:16:45.088 treats a thing that we characterize

NOTE Confidence: 0.909457062857143

00:16:45.088 --> 00:16:47.518 as a condition also enhances.

NOTE Confidence: 0.909457062857143

00:16:47.520 --> 00:16:47.780 Well,

NOTE Confidence: 0.909457062857143

00:16:47.780 --> 00:16:49.600 this is coming up in brain science

NOTE Confidence: 0.909457062857143

00:16:49.600 --> 00:16:51.845 a lot because a lot of what brain

NOTE Confidence: 0.909457062857143

00:16:51.845 --> 00:16:53.728 science is focused on is trying

NOTE Confidence: 0.909457062857143

00:16:53.728 --> 00:16:55.648 to relieve medical problems for

NOTE Confidence: 0.909457062857143

00:16:55.648 --> 00:16:58.089 people who are losing their memories

NOTE Confidence: 0.909457062857143

00:16:58.089 --> 00:17:00.513 or are losing capacity to focus

NOTE Confidence: 0.909457062857143

00:17:00.520 --> 00:17:01.520 all these kinds of things.

NOTE Confidence: 0.909457062857143

00:17:01.520 --> 00:17:04.040 And the and the treatments for those things

NOTE Confidence: 0.966358988888889

00:17:06.960 --> 00:17:11.188 very often could also be used for

NOTE Confidence: 0.966358988888889

00:17:11.188 --> 00:17:13.074 enhancement therapies. There's someone,

NOTE Confidence: 0.966358988888889

00:17:13.074 --> 00:17:15.770 there are a couple of people who claim  
NOTE Confidence: 0.966358988888889

00:17:15.832 --> 00:17:18.268 that the treatment enhancement thing in  
NOTE Confidence: 0.966358988888889

00:17:18.268 --> 00:17:21.216 brain science is different from treatment  
NOTE Confidence: 0.966358988888889

00:17:21.216 --> 00:17:24.941 enhancement in terms of the genetics of  
NOTE Confidence: 0.966358988888889

00:17:24.941 --> 00:17:27.949 muscle firing and or other things because,  
NOTE Confidence: 0.966358988888889

00:17:27.949 --> 00:17:30.523 and this is John Harris at  
NOTE Confidence: 0.966358988888889

00:17:30.523 --> 00:17:32.599 Manchester University in in the UK.  
NOTE Confidence: 0.966358988888889

00:17:32.600 --> 00:17:37.088 Because if you enhance someone's intellectual  
NOTE Confidence: 0.966358988888889

00:17:37.088 --> 00:17:40.292 capacities, you make them smarter.  
NOTE Confidence: 0.966358988888889

00:17:40.292 --> 00:17:43.357 They will become better people,  
NOTE Confidence: 0.966358988888889

00:17:43.360 --> 00:17:45.640 They will make better ethical decisions.  
NOTE Confidence: 0.966358988888889

00:17:45.640 --> 00:17:47.299 Because smarter people  
NOTE Confidence: 0.966358988888889

00:17:47.299 --> 00:17:48.958 understand arguments better,  
NOTE Confidence: 0.966358988888889

00:17:48.960 --> 00:17:51.074 take in better information, and so on.  
NOTE Confidence: 0.966358988888889

00:17:51.080 --> 00:17:52.395 And I want to say, John,  
NOTE Confidence: 0.966358988888889

00:17:52.395 --> 00:17:56.000 have you never seen a Bond film?

NOTE Confidence: 0.966358988888889  
00:17:56.000 --> 00:17:58.592 Do you not know that there are evil villains?  
NOTE Confidence: 0.706949917142857  
00:18:01.880 --> 00:18:05.800 Have you never read Hannah Arendt Anyway?  
NOTE Confidence: 0.706949917142857  
00:18:05.800 --> 00:18:08.502 So I don't believe the argument that  
NOTE Confidence: 0.706949917142857  
00:18:08.502 --> 00:18:10.885 the treatment enhancement distinction is  
NOTE Confidence: 0.706949917142857  
00:18:10.885 --> 00:18:13.210 meaningfully different in brain science  
NOTE Confidence: 0.706949917142857  
00:18:13.210 --> 00:18:16.720 than it is in other kinds of science.  
NOTE Confidence: 0.706949917142857  
00:18:16.720 --> 00:18:20.640 And finally, in the long category of  
NOTE Confidence: 0.706949917142857  
00:18:20.640 --> 00:18:23.358 things that aren't different about brain  
NOTE Confidence: 0.706949917142857  
00:18:23.358 --> 00:18:25.518 science compared to things that are  
NOTE Confidence: 0.9476364675  
00:18:28.240 --> 00:18:32.640 access and justice issues,  
NOTE Confidence: 0.9476364675  
00:18:32.640 --> 00:18:35.880 in brain science, as in  
NOTE Confidence: 0.83794697875  
00:18:38.000 --> 00:18:40.660 genetics, as in surgery,  
NOTE Confidence: 0.83794697875  
00:18:40.660 --> 00:18:43.320 as in assisted reproduction,  
NOTE Confidence: 0.83794697875  
00:18:43.320 --> 00:18:46.680 every time you invent a new thing,  
NOTE Confidence: 0.83794697875  
00:18:46.680 --> 00:18:51.080 it's expensive and it always raises the  
NOTE Confidence: 0.83794697875

00:18:51.080 --> 00:18:54.117 question of who will have access to it.  
NOTE Confidence: 0.83794697875

00:18:54.120 --> 00:18:56.005 And that question is not  
NOTE Confidence: 0.83794697875

00:18:56.005 --> 00:18:57.513 different across different fields.  
NOTE Confidence: 0.83794697875

00:18:57.520 --> 00:19:01.422 It's really a question of how we will  
NOTE Confidence: 0.83794697875

00:19:01.422 --> 00:19:04.720 ensure equitable access to any new kind of  
NOTE Confidence: 0.84160011

00:19:06.800 --> 00:19:09.680 intervention that we come up with.  
NOTE Confidence: 0.84160011

00:19:09.680 --> 00:19:13.075 So those are all really important neuro  
NOTE Confidence: 0.84160011

00:19:13.075 --> 00:19:17.320 ethics, live brain science issues,  
NOTE Confidence: 0.84160011

00:19:17.320 --> 00:19:20.800 but they aren't unique to live brain science.  
NOTE Confidence: 0.84160011

00:19:20.800 --> 00:19:26.240 OK, so Part 2, this is what's  
NOTE Confidence: 0.84160011

00:19:26.240 --> 00:19:28.640 not usual in brain science.  
NOTE Confidence: 0.84160011

00:19:28.640 --> 00:19:32.078 What does brain science have in terms of  
NOTE Confidence: 0.84160011

00:19:32.078 --> 00:19:35.594 research that other fields don't have?  
NOTE Confidence: 0.84160011

00:19:35.600 --> 00:19:40.720 One is this issue of neuro privacy,  
NOTE Confidence: 0.84160011

00:19:40.720 --> 00:19:44.620 the idea that some kinds of  
NOTE Confidence: 0.84160011

00:19:44.620 --> 00:19:47.220 brain interventions might give



NOTE Confidence: 0.84160011

00:19:47.341 --> 00:19:50.432 us eventually dangerous kinds

NOTE Confidence: 0.84160011

00:19:50.432 --> 00:19:55.600 of access to people's thoughts?

NOTE Confidence: 0.84160011

00:19:55.600 --> 00:19:56.720 You may have seen, I don't know,

NOTE Confidence: 0.84160011

00:19:56.720 --> 00:19:58.112 about four months ago,

NOTE Confidence: 0.84160011

00:19:58.112 --> 00:19:59.852 a new technology that implanted

NOTE Confidence: 0.84160011

00:19:59.852 --> 00:20:01.982 electrodes in the brain of a woman who

NOTE Confidence: 0.84160011

00:20:01.982 --> 00:20:03.797 had previously not been able to speak.

NOTE Confidence: 0.84160011

00:20:03.800 --> 00:20:06.398 And when she thought about sentences,

NOTE Confidence: 0.84160011

00:20:06.400 --> 00:20:09.874 her her thoughts were translated into

NOTE Confidence: 0.84160011

00:20:09.874 --> 00:20:13.655 words that were vocalized by, you know, AI.

NOTE Confidence: 0.84160011

00:20:13.655 --> 00:20:16.932 And I thought that was amazing, right?

NOTE Confidence: 0.84160011

00:20:16.932 --> 00:20:19.836 And then I thought,

NOTE Confidence: 0.84160011

00:20:19.840 --> 00:20:21.000 can she turn it off?

NOTE Confidence: 0.85701996

00:20:24.200 --> 00:20:25.945 Does everything that she thinks

NOTE Confidence: 0.85701996

00:20:25.945 --> 00:20:28.692 come up on this machine as long as

NOTE Confidence: 0.85701996

00:20:28.692 --> 00:20:30.552 the researchers have it on right?  
NOTE Confidence: 0.85701996

00:20:30.560 --> 00:20:32.950 So this gives you a a a sense of of  
NOTE Confidence: 0.85701996

00:20:33.020 --> 00:20:35.480 where neuro privacy issues might go.  
NOTE Confidence: 0.85701996

00:20:35.480 --> 00:20:36.965 We're not super close to  
NOTE Confidence: 0.85701996

00:20:36.965 --> 00:20:38.153 worrying about this really,  
NOTE Confidence: 0.85701996

00:20:38.160 --> 00:20:40.775 because for example, F MRI images,  
NOTE Confidence: 0.85701996

00:20:40.775 --> 00:20:42.280 it just sort of tells you which  
NOTE Confidence: 0.85701996

00:20:42.280 --> 00:20:43.767 parts of the brain are getting  
NOTE Confidence: 0.85701996

00:20:43.767 --> 00:20:45.273 more oxygen and things it doesn't.  
NOTE Confidence: 0.85701996

00:20:45.280 --> 00:20:47.114 It doesn't tell you what anyone's thinking,  
NOTE Confidence: 0.85701996

00:20:47.120 --> 00:20:48.926 but there are lie detectors and there  
NOTE Confidence: 0.85701996

00:20:48.926 --> 00:20:50.662 are much better kind of neuroscience  
NOTE Confidence: 0.85701996

00:20:50.662 --> 00:20:52.172 informed lie detectors than the  
NOTE Confidence: 0.85701996

00:20:52.172 --> 00:20:54.071 ones that just keep track of your  
NOTE Confidence: 0.85701996

00:20:54.071 --> 00:20:55.765 pulse and your breath rate, right.  
NOTE Confidence: 0.85701996

00:20:55.765 --> 00:21:00.412 And we know that we can have people

NOTE Confidence: 0.85701996

00:21:00.412 --> 00:21:03.280 on exploratory kind of brain imaging

NOTE Confidence: 0.85701996

00:21:03.280 --> 00:21:05.911 machines and find out what kinds of

NOTE Confidence: 0.85701996

00:21:05.911 --> 00:21:08.319 things they're thinking or what parts of

NOTE Confidence: 0.85701996

00:21:08.319 --> 00:21:10.797 their brain are implicated in thinking.

NOTE Confidence: 0.85701996

00:21:10.800 --> 00:21:15.200 There's a really famous ethics

NOTE Confidence: 0.85701996

00:21:15.200 --> 00:21:16.800 problem called the trolley problem

NOTE Confidence: 0.85701996

00:21:16.800 --> 00:21:18.400 that probably many of you.

NOTE Confidence: 0.85701996

00:21:18.400 --> 00:21:19.960 Yeah, I see people nodding like,

NOTE Confidence: 0.85701996

00:21:19.960 --> 00:21:22.560 oh God, not again.

NOTE Confidence: 0.85701996

00:21:22.560 --> 00:21:25.600 So the the the trolley problem is

NOTE Confidence: 0.861685947333333

00:21:28.040 --> 00:21:29.015 trolley's coming along.

NOTE Confidence: 0.861685947333333

00:21:29.015 --> 00:21:30.965 You happen to be standing near

NOTE Confidence: 0.861685947333333

00:21:30.965 --> 00:21:32.799 a lever for no good reason,

NOTE Confidence: 0.861685947333333

00:21:32.800 --> 00:21:35.200 and the trolley is going

NOTE Confidence: 0.861685947333333

00:21:35.200 --> 00:21:37.104 to plow into five people.

NOTE Confidence: 0.861685947333333

00:21:37.104 --> 00:21:39.240 But if you push the lever,  
NOTE Confidence: 0.861685947333333  
00:21:39.240 --> 00:21:41.742 it'll be shifted to a different  
NOTE Confidence: 0.861685947333333  
00:21:41.742 --> 00:21:44.399 track and plow into one person.  
NOTE Confidence: 0.861685947333333  
00:21:44.400 --> 00:21:45.872 And the question is,  
NOTE Confidence: 0.861685947333333  
00:21:45.872 --> 00:21:47.712 do you push the lever?  
NOTE Confidence: 0.861685947333333  
00:21:47.720 --> 00:21:50.480 And most people, not everyone,  
NOTE Confidence: 0.861685947333333  
00:21:50.480 --> 00:21:52.080 but most people, when asked,  
NOTE Confidence: 0.861685947333333  
00:21:52.080 --> 00:21:54.208 are willing to push the lever because  
NOTE Confidence: 0.861685947333333  
00:21:54.208 --> 00:21:56.341 they would rather sacrifice one innocent  
NOTE Confidence: 0.861685947333333  
00:21:56.341 --> 00:21:58.276 person than five innocent people,  
NOTE Confidence: 0.861685947333333  
00:21:58.280 --> 00:22:00.530 given that they know nothing else  
NOTE Confidence: 0.861685947333333  
00:22:00.530 --> 00:22:03.078 about who the people are and so on.  
NOTE Confidence: 0.861685947333333  
00:22:03.080 --> 00:22:04.670 Some people say no because they  
NOTE Confidence: 0.861685947333333  
00:22:04.670 --> 00:22:06.674 don't want to be part of the  
NOTE Confidence: 0.861685947333333  
00:22:06.674 --> 00:22:08.154 causal chain that kills anyone.  
NOTE Confidence: 0.861685947333333  
00:22:08.160 --> 00:22:09.880 They feel like I'm just going to keep

NOTE Confidence: 0.861685947333333  
00:22:09.880 --> 00:22:11.876 away from that lever and it's not my fault.  
NOTE Confidence: 0.861685947333333  
00:22:11.880 --> 00:22:13.200 Whereas if I push the lever,  
NOTE Confidence: 0.861685947333333  
00:22:13.200 --> 00:22:15.720 I killed that one person,  
NOTE Confidence: 0.861685947333333  
00:22:15.720 --> 00:22:17.554 even though I also saved the phone.  
NOTE Confidence: 0.861685947333333  
00:22:17.560 --> 00:22:17.932 OK.  
NOTE Confidence: 0.861685947333333  
00:22:17.932 --> 00:22:19.792 But then there's another version  
NOTE Confidence: 0.861685947333333  
00:22:19.792 --> 00:22:21.280 of the same problem,  
NOTE Confidence: 0.861685947333333  
00:22:21.280 --> 00:22:24.852 which is the the bridge problem,  
NOTE Confidence: 0.861685947333333  
00:22:24.852 --> 00:22:26.796 where the trolley is coming along,  
NOTE Confidence: 0.861685947333333  
00:22:26.800 --> 00:22:29.128 is going to hit 5 people and there's  
NOTE Confidence: 0.861685947333333  
00:22:29.128 --> 00:22:31.586 a bridge over the trolley track and  
NOTE Confidence: 0.861685947333333  
00:22:31.586 --> 00:22:35.560 you're standing there next to a big guy  
NOTE Confidence: 0.861685947333333  
00:22:35.560 --> 00:22:39.320 and you realize if I give this guy a shove,  
NOTE Confidence: 0.861685947333333  
00:22:39.320 --> 00:22:40.688 he's going to fall down in  
NOTE Confidence: 0.861685947333333  
00:22:40.688 --> 00:22:42.158 front of the tribe, block it.  
NOTE Confidence: 0.861685947333333

00:22:42.158 --> 00:22:44.978 I mean the trials going to run into him and  
NOTE Confidence: 0.861685947333333  
00:22:44.978 --> 00:22:47.440 get all tangled up in his body and stop.  
NOTE Confidence: 0.861685947333333  
00:22:47.440 --> 00:22:49.552 So I will have sacrificed one  
NOTE Confidence: 0.861685947333333  
00:22:49.552 --> 00:22:51.160 innocent person and saved 5.  
NOTE Confidence: 0.861685947333333  
00:22:51.160 --> 00:22:55.040 So it's the same as the previous problem.  
NOTE Confidence: 0.861685947333333  
00:22:55.040 --> 00:22:57.520 Instead of pulling a lever,  
NOTE Confidence: 0.861685947333333  
00:22:57.520 --> 00:22:59.536 I push a guy.  
NOTE Confidence: 0.861685947333333  
00:22:59.536 --> 00:23:01.270 And apart from that,  
NOTE Confidence: 0.861685947333333  
00:23:01.270 --> 00:23:04.140 I'm to blame for the death of  
NOTE Confidence: 0.861685947333333  
00:23:04.232 --> 00:23:06.638 the one and I've rescued 5.  
NOTE Confidence: 0.861685947333333  
00:23:06.640 --> 00:23:09.034 And when you ask people about that,  
NOTE Confidence: 0.861685947333333  
00:23:09.040 --> 00:23:12.596 most people say I wouldn't do that.  
NOTE Confidence: 0.861685947333333  
00:23:12.600 --> 00:23:13.724 And all the people who say, oh,  
NOTE Confidence: 0.861685947333333  
00:23:13.724 --> 00:23:15.428 I'd push the lever in the first case say, oh,  
NOTE Confidence: 0.861685947333333  
00:23:15.428 --> 00:23:17.480 I wouldn't push the guy in the second case.  
NOTE Confidence: 0.861685947333333  
00:23:17.480 --> 00:23:23.080 And Josh Green at Harvard did brain imaging

NOTE Confidence: 0.861685947333333  
00:23:23.080 --> 00:23:26.028 studies and proved that when we humans  
NOTE Confidence: 0.861685947333333  
00:23:26.028 --> 00:23:28.600 think about those two kinds of cases,  
NOTE Confidence: 0.861685947333333  
00:23:28.600 --> 00:23:30.945 we use different physical parts  
NOTE Confidence: 0.861685947333333  
00:23:30.945 --> 00:23:34.359 of our brain to think about them.  
NOTE Confidence: 0.861685947333333  
00:23:34.360 --> 00:23:35.119 The first one,  
NOTE Confidence: 0.861685947333333  
00:23:35.119 --> 00:23:36.637 because you're thinking about a lever,  
NOTE Confidence: 0.861685947333333  
00:23:36.640 --> 00:23:38.998 and it's very abstract and calculative.  
NOTE Confidence: 0.861685947333333  
00:23:39.000 --> 00:23:41.316 We deal with our prefrontal cortex,  
NOTE Confidence: 0.861685947333333  
00:23:41.320 --> 00:23:43.740 but when we're thinking about  
NOTE Confidence: 0.861685947333333  
00:23:43.740 --> 00:23:46.160 pushing someone to his death,  
NOTE Confidence: 0.861685947333333  
00:23:46.160 --> 00:23:47.699 a much deeper,  
NOTE Confidence: 0.861685947333333  
00:23:47.699 --> 00:23:48.212 older,  
NOTE Confidence: 0.861685947333333  
00:23:48.212 --> 00:23:50.777 more reptilian part of the  
NOTE Confidence: 0.861685947333333  
00:23:50.777 --> 00:23:52.719 brain is implicated.  
NOTE Confidence: 0.861685947333333  
00:23:52.720 --> 00:23:55.219 We think about that problem in a  
NOTE Confidence: 0.861685947333333

00:23:55.219 --> 00:23:57.718 different part of our brain and we go  
NOTE Confidence: 0.861685947333333

00:23:57.720 --> 00:24:01.914 that's just wrong in a in a really deep,  
NOTE Confidence: 0.861685947333333

00:24:01.920 --> 00:24:03.333 responsive,  
NOTE Confidence: 0.861685947333333

00:24:03.333 --> 00:24:06.159 automatic way.  
NOTE Confidence: 0.861685947333333

00:24:06.160 --> 00:24:08.872 That was too long a story to make  
NOTE Confidence: 0.861685947333333

00:24:08.872 --> 00:24:11.029 the point that we are already  
NOTE Confidence: 0.861685947333333

00:24:11.029 --> 00:24:13.136 able to use imaging to determine  
NOTE Confidence: 0.861685947333333

00:24:13.136 --> 00:24:15.248 which parts of someone's brain is  
NOTE Confidence: 0.861685947333333

00:24:15.248 --> 00:24:17.199 engaged when they think about what.  
NOTE Confidence: 0.861685947333333

00:24:17.200 --> 00:24:19.972 And it's not far from there  
NOTE Confidence: 0.861685947333333

00:24:19.972 --> 00:24:21.729 to worries about how.  
NOTE Confidence: 0.861685947333333

00:24:21.729 --> 00:24:23.943 Well eventually we will be able  
NOTE Confidence: 0.861685947333333

00:24:23.943 --> 00:24:26.060 to understand what people are  
NOTE Confidence: 0.861685947333333

00:24:26.060 --> 00:24:28.215 actually thinking just by seeing  
NOTE Confidence: 0.861685947333333

00:24:28.215 --> 00:24:30.240 what portions of their brain  
NOTE Confidence: 0.861685947333333

00:24:30.240 --> 00:24:32.480 they're using to do that thinking



NOTE Confidence: 0.861685947333333

00:24:32.480 --> 00:24:33.856 and and similar problems.

NOTE Confidence: 0.861685947333333

00:24:33.856 --> 00:24:35.920 So that is a unique kind

NOTE Confidence: 0.914522098333333

00:24:35.989 --> 00:24:38.586 of ethics of live brain research problem

NOTE Confidence: 0.914522098333333

00:24:38.586 --> 00:24:41.077 that we don't get in other areas.

NOTE Confidence: 0.914522098333333

00:24:41.080 --> 00:24:43.616 Second we have the problem of the moral

NOTE Confidence: 0.914522098333333

00:24:43.616 --> 00:24:45.942 status of the thing that's growing in

NOTE Confidence: 0.914522098333333

00:24:45.942 --> 00:24:48.239 the dish and here I'm thinking about

NOTE Confidence: 0.87512998

00:24:51.920 --> 00:24:55.400 brain organoids for example or something.

NOTE Confidence: 0.87512998

00:24:55.400 --> 00:24:56.640 You've got quite a few,

NOTE Confidence: 0.87512998

00:24:56.640 --> 00:24:59.104 quite a few articles and a lot of

NOTE Confidence: 0.87512998

00:24:59.104 --> 00:25:00.999 bioethics attention just a few weeks ago,

NOTE Confidence: 0.87512998

00:25:01.000 --> 00:25:06.196 these mix of of brain tissues and

NOTE Confidence: 0.87512998

00:25:06.200 --> 00:25:10.858 mechanical AI elements which in

NOTE Confidence: 0.87512998

00:25:10.858 --> 00:25:13.088 a recent publication have been

NOTE Confidence: 0.87512998

00:25:13.088 --> 00:25:17.040 shown to be able to play pong.

NOTE Confidence: 0.87512998

00:25:17.040 --> 00:25:19.280 OK, they can play pong,  
NOTE Confidence: 0.87512998

00:25:19.280 --> 00:25:20.240 which some of you,  
NOTE Confidence: 0.87512998

00:25:20.240 --> 00:25:21.200 if you're old enough,  
NOTE Confidence: 0.87512998

00:25:21.200 --> 00:25:22.760 might remember as a really primitive  
NOTE Confidence: 0.87512998

00:25:22.760 --> 00:25:24.120 video game from your youth.  
NOTE Confidence: 0.959397057142857

00:25:26.800 --> 00:25:30.118 So the question is if this thing  
NOTE Confidence: 0.959397057142857

00:25:30.120 --> 00:25:32.822 you can see an object coming and  
NOTE Confidence: 0.959397057142857

00:25:32.822 --> 00:25:35.079 strategize about how to meet it and  
NOTE Confidence: 0.959397057142857

00:25:35.080 --> 00:25:37.168 hit it in order to send it back  
NOTE Confidence: 0.959397057142857

00:25:37.168 --> 00:25:39.081 toward the goal post at the other  
NOTE Confidence: 0.959397057142857

00:25:39.081 --> 00:25:41.800 end of this hypothetical game field,  
NOTE Confidence: 0.927523158

00:25:45.960 --> 00:25:47.952 is it sentient? It seems to  
NOTE Confidence: 0.927523158

00:25:47.952 --> 00:25:49.280 be responding to external,  
NOTE Confidence: 0.9163104

00:25:52.240 --> 00:25:54.760 external stimuli.  
NOTE Confidence: 0.9163104

00:25:54.760 --> 00:25:56.237 That's what we do when we see.  
NOTE Confidence: 0.9163104

00:25:56.240 --> 00:25:58.400 That's what we do when we feel and hear.

NOTE Confidence: 0.9163104  
00:25:58.400 --> 00:25:59.520 Is this thing sentient?  
NOTE Confidence: 0.9163104  
00:25:59.520 --> 00:26:01.386 If it's sentient, is it thinking?  
NOTE Confidence: 0.9163104  
00:26:01.386 --> 00:26:03.438 Is it deciding what to do?  
NOTE Confidence: 0.9163104  
00:26:03.440 --> 00:26:05.000 If it's deciding what to do?  
NOTE Confidence: 0.9163104  
00:26:05.000 --> 00:26:07.118 Is it rational?  
NOTE Confidence: 0.9163104  
00:26:07.120 --> 00:26:08.737 Do we need to respect it as  
NOTE Confidence: 0.9163104  
00:26:08.737 --> 00:26:09.800 a moral character there?  
NOTE Confidence: 0.9163104  
00:26:09.800 --> 00:26:10.760 And it's a little dish,  
NOTE Confidence: 0.9163104  
00:26:10.760 --> 00:26:13.175 even though we made it and we  
NOTE Confidence: 0.9163104  
00:26:13.175 --> 00:26:15.397 turned it on yesterday, right?  
NOTE Confidence: 0.9163104  
00:26:15.397 --> 00:26:17.059 That doesn't come up in other  
NOTE Confidence: 0.9163104  
00:26:17.059 --> 00:26:18.719 fields other than brain sciences,  
NOTE Confidence: 0.9163104  
00:26:18.720 --> 00:26:22.440 except AI people are worried about.  
NOTE Confidence: 0.9163104  
00:26:22.440 --> 00:26:23.600 It's very strongly parallel.  
NOTE Confidence: 0.9163104  
00:26:23.600 --> 00:26:26.222 People are very worried about the  
NOTE Confidence: 0.9163104

00:26:26.222 --> 00:26:28.532 acquisition of certain kinds of  
NOTE Confidence: 0.9163104

00:26:28.532 --> 00:26:31.800 human like traits by AI or by brain  
NOTE Confidence: 0.9163104

00:26:31.800 --> 00:26:33.680 organoids that might give them  
NOTE Confidence: 0.9163104

00:26:33.767 --> 00:26:36.197 a certain kind of moral status,  
NOTE Confidence: 0.9163104

00:26:36.200 --> 00:26:38.734 which would then limit us in the way  
NOTE Confidence: 0.9163104

00:26:38.734 --> 00:26:40.240 that we could treat them in the dish.  
NOTE Confidence: 0.9163104

00:26:40.240 --> 00:26:42.496 We might have to start thinking  
NOTE Confidence: 0.9163104

00:26:42.496 --> 00:26:44.850 about them more like mice, say,  
NOTE Confidence: 0.9163104

00:26:44.850 --> 00:26:47.720 than we think about just tissue samples.  
NOTE Confidence: 0.868020208333333

00:26:51.040 --> 00:26:54.105 Another thing. I'll say another  
NOTE Confidence: 0.868020208333333

00:26:54.105 --> 00:26:55.672 difference is there's a possibility  
NOTE Confidence: 0.868020208333333

00:26:55.672 --> 00:26:57.560 in some kinds of live brain research,  
NOTE Confidence: 0.868020208333333

00:26:57.560 --> 00:27:00.560 we've had some dramatic examples of this of  
NOTE Confidence: 0.946268461428572

00:27:03.400 --> 00:27:06.473 of the research causing what we might  
NOTE Confidence: 0.946268461428572

00:27:06.473 --> 00:27:10.477 think of as changes in personal identity.  
NOTE Confidence: 0.847317495714286

00:27:13.320 --> 00:27:16.239 So for example, my colleague Joe Finns,

NOTE Confidence: 0.847317495714286

00:27:16.240 --> 00:27:18.312 who was I've been a visitor at my

NOTE Confidence: 0.847317495714286

00:27:18.312 --> 00:27:19.944 bioethics center and because of visits

NOTE Confidence: 0.847317495714286

00:27:19.944 --> 00:27:22.160 at my bioethics center is now affiliated.

NOTE Confidence: 0.847317495714286

00:27:22.160 --> 00:27:24.760 He's he's a neuroscientist from

NOTE Confidence: 0.847317495714286

00:27:24.760 --> 00:27:26.608 from from Weill Cornell Medical,

NOTE Confidence: 0.847317495714286

00:27:26.608 --> 00:27:29.320 but he's affiliated with the law school here.

NOTE Confidence: 0.847317495714286

00:27:29.320 --> 00:27:32.400 He works with law students on issues

NOTE Confidence: 0.847317495714286

00:27:32.400 --> 00:27:34.496 about various diminished states

NOTE Confidence: 0.847317495714286

00:27:34.496 --> 00:27:36.578 of consciousness, that you know,

NOTE Confidence: 0.847317495714286

00:27:36.578 --> 00:27:38.500 the difference between permanent vegetative

NOTE Confidence: 0.847317495714286

00:27:38.500 --> 00:27:40.850 state and persistent vegetative state

NOTE Confidence: 0.847317495714286

00:27:40.850 --> 00:27:42.878 and minimal consciousness and so on.

NOTE Confidence: 0.903954547142857

00:27:44.960 --> 00:27:48.216 Anyway, Joe has done some work on direct

NOTE Confidence: 0.903954547142857

00:27:48.216 --> 00:27:51.030 brain stimulation for Parkinson's that he's

NOTE Confidence: 0.903954547142857

00:27:51.030 --> 00:27:53.040 published some stuff about very recently.

NOTE Confidence: 0.903954547142857

00:27:53.040 --> 00:27:55.758 And direct brain stimulation for Parkinson's  
NOTE Confidence: 0.903954547142857

00:27:55.758 --> 00:27:59.870 in many patients is fantastic in terms of  
NOTE Confidence: 0.903954547142857

00:27:59.870 --> 00:28:03.878 restoring their physical ability to move.  
NOTE Confidence: 0.903954547142857

00:28:03.880 --> 00:28:05.356 You put electrodes in the brain.  
NOTE Confidence: 0.903954547142857

00:28:05.360 --> 00:28:07.250 You you stimulate some of the cells  
NOTE Confidence: 0.903954547142857

00:28:07.250 --> 00:28:10.608 in the brain to be to some of the  
NOTE Confidence: 0.903954547142857

00:28:10.608 --> 00:28:12.680 neurons to be charging and and working.  
NOTE Confidence: 0.903954547142857

00:28:12.680 --> 00:28:15.480 And this results in improving  
NOTE Confidence: 0.903954547142857

00:28:15.480 --> 00:28:18.280 dramatically the physically the physical  
NOTE Confidence: 0.903954547142857

00:28:18.360 --> 00:28:21.000 mobility of Parkinson's patients.  
NOTE Confidence: 0.903954547142857

00:28:21.000 --> 00:28:23.896 And it also some similar work that Joe  
NOTE Confidence: 0.903954547142857

00:28:23.896 --> 00:28:27.290 has been working on that shows it it it  
NOTE Confidence: 0.903954547142857

00:28:27.290 --> 00:28:29.324 takes people from minimally conscious  
NOTE Confidence: 0.903954547142857

00:28:29.324 --> 00:28:31.634 states to slightly more conscious  
NOTE Confidence: 0.903954547142857

00:28:31.634 --> 00:28:33.938 states because of stimulating the  
NOTE Confidence: 0.903954547142857

00:28:33.938 --> 00:28:36.476 brain to do its work electronically.

NOTE Confidence: 0.903954547142857  
00:28:36.480 --> 00:28:38.100 But there are cases,  
NOTE Confidence: 0.903954547142857  
00:28:38.100 --> 00:28:39.720 one from Scandinavia and  
NOTE Confidence: 0.817475514285714  
00:28:42.320 --> 00:28:43.839 guessing It's almost 10 years ago now,  
NOTE Confidence: 0.817475514285714  
00:28:43.840 --> 00:28:45.478 that it was the first documented  
NOTE Confidence: 0.817475514285714  
00:28:45.478 --> 00:28:46.977 case where someone had Parkinson's  
NOTE Confidence: 0.817475514285714  
00:28:46.977 --> 00:28:48.717 and the deep brain stimulation  
NOTE Confidence: 0.95330308  
00:28:51.320 --> 00:28:54.240 cured their mobility problem,  
NOTE Confidence: 0.95330308  
00:28:54.240 --> 00:28:58.104 but induced in them a really  
NOTE Confidence: 0.95330308  
00:28:58.104 --> 00:29:00.036 uncontrollable manic personality.  
NOTE Confidence: 0.95330308  
00:29:00.040 --> 00:29:03.155 So much so that the person needed  
NOTE Confidence: 0.95330308  
00:29:03.155 --> 00:29:06.034 to be civilly committed so he  
NOTE Confidence: 0.95330308  
00:29:06.034 --> 00:29:07.519 could walk around and move.  
NOTE Confidence: 0.95330308  
00:29:07.520 --> 00:29:09.758 He had all this restored mobility,  
NOTE Confidence: 0.95330308  
00:29:09.760 --> 00:29:13.176 but he had to be committed because he  
NOTE Confidence: 0.95330308  
00:29:13.176 --> 00:29:15.405 was uncontrollably manic and therefore  
NOTE Confidence: 0.95330308

00:29:15.405 --> 00:29:17.997 a danger to himself and others.

NOTE Confidence: 0.95330308

00:29:18.000 --> 00:29:19.192 And you could imagine.

NOTE Confidence: 0.95330308

00:29:19.192 --> 00:29:21.348 And here I should give credit to

NOTE Confidence: 0.95330308

00:29:21.348 --> 00:29:23.376 Adina Roskis, who writes about this

NOTE Confidence: 0.95330308

00:29:23.376 --> 00:29:25.500 in her neuroethics article on the

NOTE Confidence: 0.95330308

00:29:25.565 --> 00:29:28.800 Stanford Encyclopedia of of Philosophy.

NOTE Confidence: 0.95330308

00:29:28.800 --> 00:29:32.558 But you could imagine circumstances in which

NOTE Confidence: 0.95330308

00:29:32.560 --> 00:29:36.516 somebody like this objects to their state.

NOTE Confidence: 0.95330308

00:29:36.516 --> 00:29:38.261 They they have capacity to

NOTE Confidence: 0.95330308

00:29:38.261 --> 00:29:39.479 understand the situation.

NOTE Confidence: 0.95330308

00:29:39.480 --> 00:29:42.798 And when they're manic and and

NOTE Confidence: 0.95330308

00:29:42.800 --> 00:29:44.740 and confined because they're a

NOTE Confidence: 0.95330308

00:29:44.740 --> 00:29:46.680 danger to themselves and others,

NOTE Confidence: 0.95330308

00:29:46.680 --> 00:29:48.678 they could say stop the treatment.

NOTE Confidence: 0.95330308

00:29:48.680 --> 00:29:49.760 I don't want this treatment anymore.

NOTE Confidence: 0.95330308

00:29:49.760 --> 00:29:53.240 It's causing me to be confined.



NOTE Confidence: 0.95330308

00:29:53.240 --> 00:29:56.152 And then they go back to the state

NOTE Confidence: 0.95330308

00:29:56.152 --> 00:29:58.911 where they have highly compromised

NOTE Confidence: 0.95330308

00:29:58.911 --> 00:30:01.180 mobility and they're depressed about

NOTE Confidence: 0.95330308

00:30:01.180 --> 00:30:04.648 that and they say give me the treatment,

NOTE Confidence: 0.95330308

00:30:04.648 --> 00:30:06.408 I hate this, right.

NOTE Confidence: 0.95330308

00:30:06.408 --> 00:30:08.984 And that's an extreme version of the

NOTE Confidence: 0.95330308

00:30:08.984 --> 00:30:11.309 problem that and we've seen this in

NOTE Confidence: 0.95330308

00:30:11.309 --> 00:30:13.680 all kinds of deep brain stimulation,

NOTE Confidence: 0.95330308

00:30:13.680 --> 00:30:17.190 everything from from the level where

NOTE Confidence: 0.95330308

00:30:17.190 --> 00:30:19.964 where mood can be dramatically changed

NOTE Confidence: 0.95330308

00:30:19.964 --> 00:30:22.924 just by the presence of deep brain

NOTE Confidence: 0.95330308

00:30:22.924 --> 00:30:28.100 stimulation to serious personality

NOTE Confidence: 0.95330308

00:30:28.100 --> 00:30:30.840 components more dramatically

NOTE Confidence: 0.95330308

00:30:30.840 --> 00:30:33.600 impactful than just mood changes can

NOTE Confidence: 0.95330308

00:30:33.600 --> 00:30:36.160 be changed by brain intervention.

NOTE Confidence: 0.95330308

00:30:36.160 --> 00:30:39.466 So that is a unique problem that

NOTE Confidence: 0.95330308

00:30:39.466 --> 00:30:41.998 brain research faces also.

NOTE Confidence: 0.95330308

00:30:42.000 --> 00:30:45.395 And finally I will mention, well,

NOTE Confidence: 0.95330308

00:30:45.395 --> 00:30:46.635 now I have two more things to mention.

NOTE Confidence: 0.95330308

00:30:46.640 --> 00:30:48.308 One is my colleague at the

NOTE Confidence: 0.95330308

00:30:48.308 --> 00:30:49.720 philosophy department here at Yale,

NOTE Confidence: 0.95330308

00:30:49.720 --> 00:30:54.731 Lori Paul has this has this idea

NOTE Confidence: 0.95330308

00:30:54.731 --> 00:30:56.559 of the transformative experience,

NOTE Confidence: 0.95330308

00:30:56.560 --> 00:30:58.384 and her examples are things like

NOTE Confidence: 0.95330308

00:30:58.384 --> 00:31:00.080 getting married or buying a house.

NOTE Confidence: 0.95330308

00:31:00.080 --> 00:31:03.540 What she says is you can talk

NOTE Confidence: 0.95330308

00:31:03.540 --> 00:31:05.360 to as many people as you want.

NOTE Confidence: 0.95330308

00:31:05.360 --> 00:31:06.732 You can watch as many movies and

NOTE Confidence: 0.95330308

00:31:06.732 --> 00:31:08.198 read as many novels as you want.

NOTE Confidence: 0.95330308

00:31:08.200 --> 00:31:09.580 But guess what?

NOTE Confidence: 0.95330308

00:31:09.580 --> 00:31:12.824 You don't know what it's like to

NOTE Confidence: 0.95330308

00:31:12.824 --> 00:31:14.932 be married till you get married.

NOTE Confidence: 0.95330308

00:31:14.932 --> 00:31:16.690 You don't know what it's like

NOTE Confidence: 0.95330308

00:31:16.755 --> 00:31:18.732 to buy your first house till you

NOTE Confidence: 0.95330308

00:31:18.732 --> 00:31:20.036 buy your first house.

NOTE Confidence: 0.95330308

00:31:20.040 --> 00:31:25.116 So you can't consent to that.

NOTE Confidence: 0.95330308

00:31:25.120 --> 00:31:26.542 No one can adequately tell you

NOTE Confidence: 0.95330308

00:31:26.542 --> 00:31:28.320 what it's going to be like for you.

NOTE Confidence: 0.95330308

00:31:28.320 --> 00:31:29.824 It's a transformative experience.

NOTE Confidence: 0.95330308

00:31:29.824 --> 00:31:32.484 It's going to be radically different from

NOTE Confidence: 0.95330308

00:31:32.484 --> 00:31:34.554 anything that you've ever thought about,

NOTE Confidence: 0.95330308

00:31:34.560 --> 00:31:38.200 and it might even change who you are.

NOTE Confidence: 0.95330308

00:31:38.200 --> 00:31:38.427 OK,

NOTE Confidence: 0.95330308

00:31:38.427 --> 00:31:39.789 it turns out that there might

NOTE Confidence: 0.95330308

00:31:39.789 --> 00:31:41.200 be quite a few of those.

NOTE Confidence: 0.95330308

00:31:41.200 --> 00:31:44.440 And it also turns out that many kinds of

NOTE Confidence: 0.888717436666667

00:31:46.480 --> 00:31:50.235 brain interventions might be those  
NOTE Confidence: 0.888717436666667

00:31:50.235 --> 00:31:53.239 kinds of transformative experiences,  
NOTE Confidence: 0.888717436666667

00:31:53.240 --> 00:31:55.082 and that might actually pose some  
NOTE Confidence: 0.888717436666667

00:31:55.082 --> 00:31:56.310 interesting ethical problems about  
NOTE Confidence: 0.888717436666667

00:31:56.359 --> 00:31:57.759 the nature of informed consent.  
NOTE Confidence: 0.823262796666667

00:32:00.560 --> 00:32:03.230 Finally, there's the issue in Brain  
NOTE Confidence: 0.823262796666667

00:32:03.230 --> 00:32:06.464 in Live Brain Science of the whole  
NOTE Confidence: 0.823262796666667

00:32:06.464 --> 00:32:08.754 idea of a neurodiversity movement,  
NOTE Confidence: 0.823262796666667

00:32:08.760 --> 00:32:10.506 which raises lots of questions about  
NOTE Confidence: 0.823262796666667

00:32:10.506 --> 00:32:12.051 what is actually the condition  
NOTE Confidence: 0.823262796666667

00:32:12.051 --> 00:32:13.752 that should be treated right.  
NOTE Confidence: 0.823262796666667

00:32:13.752 --> 00:32:16.296 There are people with autism who  
NOTE Confidence: 0.823262796666667

00:32:16.296 --> 00:32:19.712 claim that autism is not a disease.  
NOTE Confidence: 0.823262796666667

00:32:19.720 --> 00:32:20.812 It's not the kind of thing we  
NOTE Confidence: 0.823262796666667

00:32:20.812 --> 00:32:21.760 should be trying to eradicate.  
NOTE Confidence: 0.823262796666667

00:32:21.760 --> 00:32:23.200 It's not the kind of thing

NOTE Confidence: 0.823262796666667  
00:32:23.200 --> 00:32:24.400 that I require treatment for.  
NOTE Confidence: 0.823262796666667  
00:32:24.400 --> 00:32:26.422 It's just a different way of  
NOTE Confidence: 0.823262796666667  
00:32:26.422 --> 00:32:28.178 perceiving the world, in some cases,  
NOTE Confidence: 0.823262796666667  
00:32:28.178 --> 00:32:29.162 quite a radically different  
NOTE Confidence: 0.823262796666667  
00:32:29.162 --> 00:32:30.359 way of perceiving the world.  
NOTE Confidence: 0.823262796666667  
00:32:30.360 --> 00:32:32.296 But in many cases,  
NOTE Confidence: 0.823262796666667  
00:32:32.296 --> 00:32:34.716 it allows people with autism  
NOTE Confidence: 0.823262796666667  
00:32:34.720 --> 00:32:36.820 extraordinary kinds of access to  
NOTE Confidence: 0.823262796666667  
00:32:36.820 --> 00:32:39.378 all kinds of sensory input that  
NOTE Confidence: 0.823262796666667  
00:32:39.378 --> 00:32:41.698 other humans just don't get right.  
NOTE Confidence: 0.823262796666667  
00:32:41.698 --> 00:32:44.206 And the whole neurodiversity issue is  
NOTE Confidence: 0.823262796666667  
00:32:44.206 --> 00:32:46.518 a particular challenge in brain science  
NOTE Confidence: 0.823262796666667  
00:32:46.520 --> 00:32:48.752 in a way that is not in other areas.  
NOTE Confidence: 0.957338016  
00:32:52.760 --> 00:32:57.720 OK, so that was my, I don't know  
NOTE Confidence: 0.957338016  
00:32:57.720 --> 00:33:01.136 my 15 minute overview of of all  
NOTE Confidence: 0.957338016

00:33:01.136 --> 00:33:03.756 of neuroethics and which bits  
NOTE Confidence: 0.957338016

00:33:03.756 --> 00:33:06.800 of it are unique to live brain  
NOTE Confidence: 0.957338016

00:33:06.800 --> 00:33:11.280 work and which bits of it aren't.  
NOTE Confidence: 0.957338016

00:33:11.280 --> 00:33:13.302 So now I'm going to talk  
NOTE Confidence: 0.957338016

00:33:13.302 --> 00:33:15.479 about mostly pig brains.  
NOTE Confidence: 0.41366653

00:33:20.720 --> 00:33:24.480 So in 19, it was 19. That's how old I am. In  
NOTE Confidence: 0.922780342

00:33:27.160 --> 00:33:31.468 2018, I think it was, I got a panicked  
NOTE Confidence: 0.922780342

00:33:31.468 --> 00:33:34.305 phone call from Nenad Sestan and a  
NOTE Confidence: 0.922780342

00:33:34.305 --> 00:33:38.332 couple of his senior doctoral and  
NOTE Confidence: 0.922780342

00:33:38.332 --> 00:33:40.062 postdoctoral students in his neural  
NOTE Confidence: 0.922780342

00:33:40.062 --> 00:33:42.200 lab here at Yale Med, he said.  
NOTE Confidence: 0.77714568375

00:33:44.560 --> 00:33:47.230 With this project where we're trying  
NOTE Confidence: 0.77714568375

00:33:47.230 --> 00:33:49.404 to keep brain tissue alive so  
NOTE Confidence: 0.77714568375

00:33:49.404 --> 00:33:52.400 that we can do it in our research,  
NOTE Confidence: 0.77714568375

00:33:52.400 --> 00:33:54.423 and what we've been doing is we've  
NOTE Confidence: 0.77714568375

00:33:54.423 --> 00:33:56.383 been hooking up these brains to

NOTE Confidence: 0.77714568375

00:33:56.383 --> 00:33:58.093 a perfusion machine that pushes

NOTE Confidence: 0.77714568375

00:33:58.093 --> 00:33:59.880 A perfusate through the brain.

NOTE Confidence: 0.77714568375

00:33:59.880 --> 00:34:03.880 And and just for caution's sake,

NOTE Confidence: 0.77714568375

00:34:03.880 --> 00:34:06.916 we've been putting Eggs on them.

NOTE Confidence: 0.77714568375

00:34:06.920 --> 00:34:10.676 And yesterday we saw some organized

NOTE Confidence: 0.77714568375

00:34:10.680 --> 00:34:12.756 activity showing up on the EEG,

NOTE Confidence: 0.77714568375

00:34:12.760 --> 00:34:14.440 so we shut down the entire experiment

NOTE Confidence: 0.77714568375

00:34:14.440 --> 00:34:16.120 and we heard you were a bioethicist

NOTE Confidence: 0.77714568375

00:34:16.120 --> 00:34:17.959 and we wanted to talk to you about

NOTE Confidence: 0.7516349

00:34:20.200 --> 00:34:22.890 it. So two things were great

NOTE Confidence: 0.7516349

00:34:22.890 --> 00:34:23.954 about that phone call.

NOTE Confidence: 0.7516349

00:34:23.960 --> 00:34:26.894 One is that it started me in a relationship

NOTE Confidence: 0.7516349

00:34:26.894 --> 00:34:29.677 with Sestine Lab that has lasted to now,

NOTE Confidence: 0.7516349

00:34:29.680 --> 00:34:31.816 which has been one of the more interesting

NOTE Confidence: 0.7516349

00:34:31.816 --> 00:34:33.836 and rewarding parts of my professional life.

NOTE Confidence: 0.7516349

00:34:33.840 --> 00:34:36.240 And two, the EEG signals they  
NOTE Confidence: 0.7516349  
00:34:36.240 --> 00:34:37.840 were getting were artifactual.  
NOTE Confidence: 0.7516349  
00:34:37.840 --> 00:34:39.286 They were just coming off other  
NOTE Confidence: 0.7516349  
00:34:39.286 --> 00:34:40.720 parts of their electrical equipment,  
NOTE Confidence: 0.7516349  
00:34:40.720 --> 00:34:42.960 and the brain had not actually woken up.  
NOTE Confidence: 0.7516349  
00:34:42.960 --> 00:34:46.428 So first we got to go, OK,  
NOTE Confidence: 0.7516349  
00:34:46.428 --> 00:34:49.765 but then we got to think, right?  
NOTE Confidence: 0.7516349  
00:34:49.765 --> 00:34:52.915 Because here's what they were doing.  
NOTE Confidence: 0.7516349  
00:34:52.920 --> 00:34:53.559 They were getting  
NOTE Confidence: 0.948166448  
00:34:55.960 --> 00:35:00.239 in an effort to preserve functional  
NOTE Confidence: 0.948166448  
00:35:00.239 --> 00:35:02.633 tissue for as long as possible  
NOTE Confidence: 0.948166448  
00:35:02.633 --> 00:35:04.810 for use in the lab, right?  
NOTE Confidence: 0.948166448  
00:35:04.810 --> 00:35:06.840 They wanted to have tissue that they  
NOTE Confidence: 0.948166448  
00:35:06.840 --> 00:35:08.652 could use and research that had did  
NOTE Confidence: 0.948166448  
00:35:08.652 --> 00:35:10.724 not have a lot of warm ischemic time  
NOTE Confidence: 0.948166448  
00:35:10.724 --> 00:35:13.096 and a lot of cellular damage and so on.



NOTE Confidence: 0.948166448

00:35:13.096 --> 00:35:14.808 So they thought, can we come up

NOTE Confidence: 0.948166448

00:35:14.808 --> 00:35:16.168 with a preservation method that

NOTE Confidence: 0.948166448

00:35:16.168 --> 00:35:17.558 we can use in the lab?

NOTE Confidence: 0.948166448

00:35:17.560 --> 00:35:19.675 And in an effort to try to preserve tissue,

NOTE Confidence: 0.948166448

00:35:19.680 --> 00:35:23.220 a couple of the postdocs in the

NOTE Confidence: 0.948166448

00:35:23.220 --> 00:35:25.721 lab came up with a perfusion

NOTE Confidence: 0.948166448

00:35:25.721 --> 00:35:27.597 machine and a perfusate

NOTE Confidence: 0.88304311

00:35:30.320 --> 00:35:32.520 that they could hook surgically

NOTE Confidence: 0.88304311

00:35:32.520 --> 00:35:35.838 to the vasculature of a pig brain

NOTE Confidence: 0.88304311

00:35:35.840 --> 00:35:38.198 and pump the fluid through it,

NOTE Confidence: 0.88304311

00:35:38.200 --> 00:35:40.559 supplying it with oxygen, supplying it with

NOTE Confidence: 0.9345116575

00:35:42.680 --> 00:35:45.760 glucose and so on. And then

NOTE Confidence: 0.930854307142857

00:35:47.800 --> 00:35:50.474 and cycle that through again and again,

NOTE Confidence: 0.930854307142857

00:35:50.480 --> 00:35:52.060 filter out cellular waste that's

NOTE Confidence: 0.930854307142857

00:35:52.060 --> 00:35:53.992 taken out of the brain and

NOTE Confidence: 0.930854307142857

00:35:53.992 --> 00:35:55.714 just keep going with the brain.  
NOTE Confidence: 0.930854307142857

00:35:55.720 --> 00:35:57.292 And at this point,  
NOTE Confidence: 0.930854307142857

00:35:57.292 --> 00:36:00.141 they were able to keep brains going  
NOTE Confidence: 0.930854307142857

00:36:00.141 --> 00:36:03.798 for about six hours or so post mortem.  
NOTE Confidence: 0.930854307142857

00:36:03.800 --> 00:36:07.048 So they would they would go to a  
NOTE Confidence: 0.930854307142857

00:36:07.048 --> 00:36:09.264 slaughterhouse near New Haven where  
NOTE Confidence: 0.930854307142857

00:36:09.264 --> 00:36:11.916 pigs were being killed for sausage.  
NOTE Confidence: 0.930854307142857

00:36:11.920 --> 00:36:14.560 And they would buy a head  
NOTE Confidence: 0.930854307142857

00:36:14.560 --> 00:36:15.908 from the slaughterhouse dude,  
NOTE Confidence: 0.930854307142857

00:36:15.908 --> 00:36:18.999 and take the head on ice back to the lab,  
NOTE Confidence: 0.930854307142857

00:36:19.000 --> 00:36:19.434 exsanguinated.  
NOTE Confidence: 0.930854307142857

00:36:19.434 --> 00:36:22.472 And it would take them about a  
NOTE Confidence: 0.930854307142857

00:36:22.472 --> 00:36:24.997 full hour from the pig's death  
NOTE Confidence: 0.930854307142857

00:36:25.000 --> 00:36:28.360 to attach the now ex vivo brain.  
NOTE Confidence: 0.930854307142857

00:36:28.360 --> 00:36:30.598 The whole head has been removed,  
NOTE Confidence: 0.930854307142857

00:36:30.600 --> 00:36:33.620 had no blood and therefore

NOTE Confidence: 0.930854307142857  
00:36:33.620 --> 00:36:36.640 no oxygen for an hour,  
NOTE Confidence: 0.930854307142857  
00:36:36.640 --> 00:36:38.215 and at about the one hour point  
NOTE Confidence: 0.930854307142857  
00:36:38.215 --> 00:36:39.620 they could finish up the surgery  
NOTE Confidence: 0.930854307142857  
00:36:39.620 --> 00:36:40.970 and have the have the thing  
NOTE Confidence: 0.930854307142857  
00:36:40.970 --> 00:36:42.078 hooked up to the machine.  
NOTE Confidence: 0.930854307142857  
00:36:42.080 --> 00:36:43.480 And then they started to profuse it.  
NOTE Confidence: 0.930854307142857  
00:36:43.480 --> 00:36:48.276 And what they found was that a lot of  
NOTE Confidence: 0.930854307142857  
00:36:48.276 --> 00:36:50.336 the ischemic damage was successfully  
NOTE Confidence: 0.930854307142857  
00:36:50.336 --> 00:36:52.954 reversed by exposure to this fluid,  
NOTE Confidence: 0.930854307142857  
00:36:52.954 --> 00:36:56.278 and the brains began to function  
NOTE Confidence: 0.95976126  
00:36:58.320 --> 00:36:59.080 normally  
NOTE Confidence: 0.938524715555556  
00:37:01.120 --> 00:37:03.200 metabolically, taking in appropriate  
NOTE Confidence: 0.938524715555556  
00:37:03.200 --> 00:37:05.800 levels of oxygen and glucose,  
NOTE Confidence: 0.938524715555556  
00:37:05.800 --> 00:37:06.746 releasing appropriate  
NOTE Confidence: 0.938524715555556  
00:37:06.746 --> 00:37:08.638 levels of cellular waste.  
NOTE Confidence: 0.938524715555556

00:37:08.640 --> 00:37:10.728 A lot of what happens with  
NOTE Confidence: 0.938524715555556

00:37:10.728 --> 00:37:12.500 ischemic damage is that cells  
NOTE Confidence: 0.938524715555556

00:37:12.500 --> 00:37:14.400 begin to swell with waste,  
NOTE Confidence: 0.938524715555556

00:37:14.400 --> 00:37:15.780 and then they burst.  
NOTE Confidence: 0.938524715555556

00:37:15.780 --> 00:37:17.505 But being exposed to this  
NOTE Confidence: 0.938524715555556

00:37:17.505 --> 00:37:19.019 perfusate actually cleared a  
NOTE Confidence: 0.938524715555556

00:37:19.019 --> 00:37:21.233 bunch of that waste and reversed  
NOTE Confidence: 0.938524715555556

00:37:21.233 --> 00:37:23.050 ischemic damage across all the  
NOTE Confidence: 0.938524715555556

00:37:23.050 --> 00:37:24.775 different kinds of cell types  
NOTE Confidence: 0.938524715555556

00:37:24.775 --> 00:37:26.478 that you can find in a pig brain.  
NOTE Confidence: 0.942958814285714

00:37:28.760 --> 00:37:31.035 So the paper in 2019 came out,  
NOTE Confidence: 0.942958814285714

00:37:31.040 --> 00:37:32.940 Nature, basically showing that  
NOTE Confidence: 0.942958814285714

00:37:32.940 --> 00:37:35.790 they've been able to reverse ischemic  
NOTE Confidence: 0.942958814285714

00:37:35.861 --> 00:37:39.230 damage post mortem and sustain the  
NOTE Confidence: 0.942958814285714

00:37:39.230 --> 00:37:41.680 brain metabolically for six hours.  
NOTE Confidence: 0.794851058571429

00:37:44.520 --> 00:37:45.942 Why six hours?

NOTE Confidence: 0.794851058571429  
00:37:45.942 --> 00:37:47.838 Because their controlled brains,  
NOTE Confidence: 0.794851058571429  
00:37:47.840 --> 00:37:50.368 which weren't being perfused,  
NOTE Confidence: 0.794851058571429  
00:37:50.368 --> 00:37:53.400 had turned into yogurt at six hours,  
NOTE Confidence: 0.794851058571429  
00:37:53.400 --> 00:37:55.026 so they had nothing more to  
NOTE Confidence: 0.794851058571429  
00:37:55.026 --> 00:37:56.320 compare their study brains to.  
NOTE Confidence: 0.794851058571429  
00:37:56.320 --> 00:37:58.006 So that's sort of where they  
NOTE Confidence: 0.794851058571429  
00:37:58.006 --> 00:37:59.914 had to stop because the control  
NOTE Confidence: 0.794851058571429  
00:37:59.914 --> 00:38:01.358 just didn't work anymore.  
NOTE Confidence: 0.794851058571429  
00:38:01.360 --> 00:38:05.596 Today, it's not hours, it's days.  
NOTE Confidence: 0.794851058571429  
00:38:05.600 --> 00:38:08.800 It's more than a week in some cases,  
NOTE Confidence: 0.794851058571429  
00:38:08.800 --> 00:38:11.278 that they can keep a pig brain  
NOTE Confidence: 0.794851058571429  
00:38:11.280 --> 00:38:12.452 metabolically functioning  
NOTE Confidence: 0.794851058571429  
00:38:12.452 --> 00:38:14.796 on this perfusion machine.  
NOTE Confidence: 0.967728971428571  
00:38:16.920 --> 00:38:20.000 Do they wake up? You may ask.  
NOTE Confidence: 0.967728971428571  
00:38:20.000 --> 00:38:22.954 No, they do not, and they cannot.  
NOTE Confidence: 0.967728971428571

00:38:22.960 --> 00:38:25.408 And the reason that they cannot is that  
NOTE Confidence: 0.967728971428571

00:38:25.408 --> 00:38:27.874 the perfusate contains no sodium and  
NOTE Confidence: 0.967728971428571

00:38:27.874 --> 00:38:32.398 neurons cannot fire without any sodium.  
NOTE Confidence: 0.967728971428571

00:38:32.400 --> 00:38:35.850 When you take a neuron out of one of these  
NOTE Confidence: 0.967728971428571

00:38:35.937 --> 00:38:38.877 brains and rinse off the perfusate and  
NOTE Confidence: 0.967728971428571

00:38:38.877 --> 00:38:41.920 give it the right kind of atmosphere,  
NOTE Confidence: 0.967728971428571

00:38:41.920 --> 00:38:44.320 it'll it'll fire again.  
NOTE Confidence: 0.967728971428571

00:38:44.320 --> 00:38:45.520 They're alive.  
NOTE Confidence: 0.967728971428571

00:38:45.520 --> 00:38:47.800 They're metabolizing glucose and oxygen.  
NOTE Confidence: 0.967728971428571

00:38:47.800 --> 00:38:49.640 They're releasing cellular waste.  
NOTE Confidence: 0.967728971428571

00:38:49.640 --> 00:38:51.480 They're just not firing.  
NOTE Confidence: 0.967728971428571

00:38:51.480 --> 00:38:55.840 So it's as if we had a perfectly  
NOTE Confidence: 0.967728971428571

00:38:55.840 --> 00:38:58.510 functioning Ford Montego that we  
NOTE Confidence: 0.967728971428571

00:38:58.510 --> 00:39:01.703 were studying because we wanted to  
NOTE Confidence: 0.967728971428571

00:39:01.703 --> 00:39:04.005 learn things about Ford Montego's.  
NOTE Confidence: 0.967728971428571

00:39:04.005 --> 00:39:07.395 We just don't turn it on.

NOTE Confidence: 0.967728971428571

00:39:07.400 --> 00:39:12.017 OK, so the pig brains are in there and

NOTE Confidence: 0.967728971428571

00:39:12.017 --> 00:39:15.931 they're being and they're being exposed

NOTE Confidence: 0.967728971428571

00:39:15.931 --> 00:39:18.874 to this perfusate and they are living

NOTE Confidence: 0.967728971428571

00:39:18.874 --> 00:39:21.718 at the metabolic and cellular level,

NOTE Confidence: 0.967728971428571

00:39:21.720 --> 00:39:23.200 not just for hours anymore,

NOTE Confidence: 0.967728971428571

00:39:23.200 --> 00:39:24.120 but for days and days.

NOTE Confidence: 0.967728971428571

00:39:24.120 --> 00:39:25.932 We've done this now with hundreds

NOTE Confidence: 0.967728971428571

00:39:25.932 --> 00:39:27.600 and hundreds of big brands.

NOTE Confidence: 0.967728971428571

00:39:27.600 --> 00:39:28.952 They're all EEG monitored.

NOTE Confidence: 0.967728971428571

00:39:28.952 --> 00:39:30.980 We've never seen any evidence of

NOTE Confidence: 0.967728971428571

00:39:31.044 --> 00:39:32.934 organized electrical activity of the

NOTE Confidence: 0.967728971428571

00:39:32.934 --> 00:39:35.120 sort that would be associated with

NOTE Confidence: 0.967728971428571

00:39:35.120 --> 00:39:37.120 consciousness or experience or anything.

NOTE Confidence: 0.967728971428571

00:39:37.120 --> 00:39:38.116 And besides that,

NOTE Confidence: 0.967728971428571

00:39:38.116 --> 00:39:40.108 they're just brains in a vast

NOTE Confidence: 0.967728971428571

00:39:40.108 --> 00:39:42.130 they're not connected to a nervous  
NOTE Confidence: 0.967728971428571

00:39:42.130 --> 00:39:43.760 system or eyeballs or ears.  
NOTE Confidence: 0.967728971428571

00:39:43.760 --> 00:39:45.680 So there's nothing coming in  
NOTE Confidence: 0.967728971428571

00:39:45.680 --> 00:39:47.600 to them to stimulate anything,  
NOTE Confidence: 0.967728971428571

00:39:47.600 --> 00:39:49.120 any kind of activity.  
NOTE Confidence: 0.90242422

00:39:54.160 --> 00:39:56.920 So what kinds of issues does this raise?  
NOTE Confidence: 0.90242422

00:39:56.920 --> 00:39:59.080 Ethical issues, does this raise?  
NOTE Confidence: 0.90242422

00:39:59.080 --> 00:40:01.480 Because this is different from doing  
NOTE Confidence: 0.90242422

00:40:01.480 --> 00:40:05.560 this kind of research in a living animal.  
NOTE Confidence: 0.90242422

00:40:05.560 --> 00:40:08.786 You know, I think you and I will  
NOTE Confidence: 0.90242422

00:40:08.786 --> 00:40:11.010 agree when we have the brain in  
NOTE Confidence: 0.90242422

00:40:11.010 --> 00:40:13.308 the lab and we're perfusing it.  
NOTE Confidence: 0.90242422

00:40:13.308 --> 00:40:16.599 And it's been going there for six hours  
NOTE Confidence: 0.90242422

00:40:16.600 --> 00:40:19.200 and then it's been there for two days.  
NOTE Confidence: 0.90242422

00:40:19.200 --> 00:40:23.960 The pig is dead by cardiovascular criteria,  
NOTE Confidence: 0.90242422

00:40:23.960 --> 00:40:25.360 if nothing else, right?



NOTE Confidence: 0.90242422

00:40:25.360 --> 00:40:26.760 The pig is dead.

NOTE Confidence: 0.90242422

00:40:26.760 --> 00:40:29.478 It's been ground up for sausage.

NOTE Confidence: 0.90242422

00:40:29.480 --> 00:40:31.280 So the kinds of questions

NOTE Confidence: 0.90242422

00:40:31.280 --> 00:40:33.032 that we have are about,

NOTE Confidence: 0.90242422

00:40:33.032 --> 00:40:34.712 they're more like the moral

NOTE Confidence: 0.90242422

00:40:34.712 --> 00:40:36.518 status of what's in the dish,

NOTE Confidence: 0.90242422

00:40:36.520 --> 00:40:38.550 kind of questions that I raised earlier

NOTE Confidence: 0.90242422

00:40:38.550 --> 00:40:40.118 about what's going on with this,

NOTE Confidence: 0.90242422

00:40:40.120 --> 00:40:41.359 with this brain.

NOTE Confidence: 0.90242422

00:40:41.359 --> 00:40:43.424 There are of course the

NOTE Confidence: 0.90242422

00:40:43.424 --> 00:40:44.840 normal analytics issues.

NOTE Confidence: 0.90242422

00:40:44.840 --> 00:40:48.360 Pigs are smart social animals.

NOTE Confidence: 0.90242422

00:40:48.360 --> 00:40:50.920 Should we be using them

NOTE Confidence: 0.90242422

00:40:50.920 --> 00:40:53.480 for this kind of research?

NOTE Confidence: 0.90242422

00:40:53.480 --> 00:40:56.120 And I think I

NOTE Confidence: 0.877553516190476

00:40:59.040 --> 00:41:01.344 I work on this but I answer in the  
NOTE Confidence: 0.877553516190476

00:41:01.344 --> 00:41:03.047 affirmative and the reason that I  
NOTE Confidence: 0.877553516190476

00:41:03.047 --> 00:41:04.720 answer in the affirmative is that  
NOTE Confidence: 0.877553516190476

00:41:04.720 --> 00:41:08.392 there is a huge amount of promise in  
NOTE Confidence: 0.877553516190476

00:41:08.392 --> 00:41:12.484 if you can keep a a large mammalian  
NOTE Confidence: 0.877553516190476

00:41:12.484 --> 00:41:15.630 brain functioning on a machine that  
NOTE Confidence: 0.877553516190476

00:41:15.630 --> 00:41:18.360 is a much better platform for testing  
NOTE Confidence: 0.877553516190476

00:41:18.360 --> 00:41:20.628 brain disease related drugs than  
NOTE Confidence: 0.877553516190476

00:41:20.628 --> 00:41:23.676 mice which is the current standard.  
NOTE Confidence: 0.877553516190476

00:41:23.680 --> 00:41:28.918 And it is also it is permitted  
NOTE Confidence: 0.877553516190476

00:41:28.920 --> 00:41:31.720 some kinds of unprecedented and  
NOTE Confidence: 0.877553516190476

00:41:31.720 --> 00:41:36.200 soon to be published brain mapping.  
NOTE Confidence: 0.877553516190476

00:41:36.200 --> 00:41:38.264 If if you have a brain that is  
NOTE Confidence: 0.877553516190476

00:41:38.264 --> 00:41:40.975 that you can observe while it's  
NOTE Confidence: 0.877553516190476

00:41:40.975 --> 00:41:44.236 metabolically functioning for days,  
NOTE Confidence: 0.877553516190476

00:41:44.236 --> 00:41:46.448 you can put markers in that brain

NOTE Confidence: 0.877553516190476  
00:41:46.448 --> 00:41:48.734 and you can map the brain connectome  
NOTE Confidence: 0.877553516190476  
00:41:48.734 --> 00:41:50.600 in a cell by cell, way,  
NOTE Confidence: 0.877553516190476  
00:41:50.600 --> 00:41:52.560 that has just never been done before.  
NOTE Confidence: 0.877553516190476  
00:41:52.560 --> 00:41:54.690 And that will be incredibly  
NOTE Confidence: 0.877553516190476  
00:41:54.690 --> 00:41:56.394 awesome for brain science.  
NOTE Confidence: 0.877553516190476  
00:41:56.400 --> 00:41:57.915 Not only clinical,  
NOTE Confidence: 0.877553516190476  
00:41:57.915 --> 00:42:00.440 but just basic brain science.  
NOTE Confidence: 0.877553516190476  
00:42:00.440 --> 00:42:02.840 So there's lots of cool stuff about this.  
NOTE Confidence: 0.877553516190476  
00:42:02.840 --> 00:42:04.080 So the animal ethics thing,  
NOTE Confidence: 0.877553516190476  
00:42:04.080 --> 00:42:05.880 I think it is worth  
NOTE Confidence: 0.877553516190476  
00:42:05.880 --> 00:42:06.960 actually sacrificing pigs.  
NOTE Confidence: 0.877553516190476  
00:42:06.960 --> 00:42:12.872 The bonus is that we can say for the vast,  
NOTE Confidence: 0.877553516190476  
00:42:12.872 --> 00:42:14.931 vast majority of the hundreds  
NOTE Confidence: 0.877553516190476  
00:42:14.931 --> 00:42:16.233 and hundreds of pigs we've used,  
NOTE Confidence: 0.877553516190476  
00:42:16.240 --> 00:42:18.544 we can say that these pigs didn't die for  
NOTE Confidence: 0.877553516190476

00:42:18.544 --> 00:42:21.079 the research because they died for sausage,

NOTE Confidence: 0.877553516190476

00:42:21.080 --> 00:42:21.398 right?

NOTE Confidence: 0.877553516190476

00:42:21.398 --> 00:42:23.306 So we're getting the brains from

NOTE Confidence: 0.877553516190476

00:42:23.306 --> 00:42:25.505 pigs that were going to be killed

NOTE Confidence: 0.877553516190476

00:42:25.505 --> 00:42:27.432 anyway that indeed were killed,

NOTE Confidence: 0.877553516190476

00:42:27.432 --> 00:42:27.840 right?

NOTE Confidence: 0.9678977

00:42:31.680 --> 00:42:32.280 Second,

NOTE Confidence: 0.943683587142857

00:42:34.920 --> 00:42:36.957 does this do anything to brain death?

NOTE Confidence: 0.941959965

00:42:40.040 --> 00:42:42.884 Most states in the country use

NOTE Confidence: 0.941959965

00:42:42.884 --> 00:42:44.780 the Uniform Determination of

NOTE Confidence: 0.941959965

00:42:44.866 --> 00:42:47.356 Death Act to decide who's dead,

NOTE Confidence: 0.941959965

00:42:47.360 --> 00:42:48.400 and they have two standards.

NOTE Confidence: 0.941959965

00:42:48.400 --> 00:42:49.840 They have cardio pulmonary standards.

NOTE Confidence: 0.941959965

00:42:49.840 --> 00:42:51.560 They have brain death standards.

NOTE Confidence: 0.941959965

00:42:51.560 --> 00:42:53.476 Cardio pulmonary Standards says

NOTE Confidence: 0.941959965

00:42:53.476 --> 00:42:55.392 complete and irreversible cessation

NOTE Confidence: 0.941959965

00:42:55.392 --> 00:42:57.599 of cardio pulmonary function.

NOTE Confidence: 0.941959965

00:42:57.600 --> 00:42:59.958 Brain death standards as complete and

NOTE Confidence: 0.941959965

00:42:59.958 --> 00:43:02.480 irreversible cessation of all brain function,

NOTE Confidence: 0.941959965

00:43:02.480 --> 00:43:04.960 including in the brain stem. OK.

NOTE Confidence: 0.9209952

00:43:09.120 --> 00:43:13.408 Irreversible might actually be a

NOTE Confidence: 0.9209952

00:43:13.408 --> 00:43:15.640 little bit undermined by this work.

NOTE Confidence: 0.9209952

00:43:15.640 --> 00:43:17.894 Because if you think about taking a

NOTE Confidence: 0.9209952

00:43:17.894 --> 00:43:20.157 brain that has not had any oxygen,

NOTE Confidence: 0.9209952

00:43:20.160 --> 00:43:25.070 not even any blood for an hour and

NOTE Confidence: 0.9209952

00:43:25.070 --> 00:43:27.550 getting it to turn on and function at

NOTE Confidence: 0.9209952

00:43:27.550 --> 00:43:30.000 the metabolic and cellular levels,

NOTE Confidence: 0.9209952

00:43:30.000 --> 00:43:31.388 that's at a minimum.

NOTE Confidence: 0.9209952

00:43:31.388 --> 00:43:34.005 That means that a lot of stuff

NOTE Confidence: 0.9209952

00:43:34.005 --> 00:43:36.717 that was thought to be irreversible

NOTE Confidence: 0.9209952

00:43:36.720 --> 00:43:40.444 a couple of years ago is now

NOTE Confidence: 0.9209952

00:43:40.444 --> 00:43:42.040 very possibly reversible.  
NOTE Confidence: 0.9209952

00:43:42.040 --> 00:43:44.040 What we've discovered is,  
NOTE Confidence: 0.9209952

00:43:44.040 --> 00:43:47.040 is a great deal more robustness.  
NOTE Confidence: 0.9209952

00:43:47.040 --> 00:43:51.480 That's a word Robustity to to  
NOTE Confidence: 0.9209952

00:43:51.480 --> 00:43:55.000 ischemic damage than anybody thought.  
NOTE Confidence: 0.936889186

00:44:00.040 --> 00:44:02.063 Luckily for us, our work is hardly  
NOTE Confidence: 0.936889186

00:44:02.063 --> 00:44:04.272 the only thing that's getting in the  
NOTE Confidence: 0.936889186

00:44:04.272 --> 00:44:06.186 way of our current standards for  
NOTE Confidence: 0.936889186

00:44:06.248 --> 00:44:08.481 brain death and of that law that  
NOTE Confidence: 0.936889186

00:44:08.481 --> 00:44:10.324 determines what brain death is.  
NOTE Confidence: 0.936889186

00:44:10.324 --> 00:44:12.092 There's a million problems  
NOTE Confidence: 0.936889186

00:44:12.092 --> 00:44:14.240 with brain death right now.  
NOTE Confidence: 0.936889186

00:44:14.240 --> 00:44:16.200 First of all, some groups,  
NOTE Confidence: 0.936889186

00:44:16.200 --> 00:44:18.000 for religious and cultural reasons,  
NOTE Confidence: 0.936889186

00:44:18.000 --> 00:44:20.000 object to the very idea of brain death.  
NOTE Confidence: 0.936889186

00:44:20.000 --> 00:44:22.436 Like many Orthodox Jews think that

NOTE Confidence: 0.936889186

00:44:22.440 --> 00:44:24.645 in in the Torah and tell what

NOTE Confidence: 0.936889186

00:44:24.645 --> 00:44:27.685 a commentary's life is so fully

NOTE Confidence: 0.936889186

00:44:27.685 --> 00:44:29.774 associated with breath that they

NOTE Confidence: 0.936889186

00:44:29.774 --> 00:44:31.363 don't want to accept the brain death

NOTE Confidence: 0.936889186

00:44:31.363 --> 00:44:33.068 criteria and they only want to accept

NOTE Confidence: 0.936889186

00:44:33.068 --> 00:44:34.320 cardio pulmonary criteria for death.

NOTE Confidence: 0.954841612857143

00:44:36.360 --> 00:44:38.950 Apart from that, many other people just

NOTE Confidence: 0.954841612857143

00:44:38.950 --> 00:44:41.877 don't trust a diagnosis of brain death,

NOTE Confidence: 0.954841612857143

00:44:41.880 --> 00:44:43.130 partly for these very understandable

NOTE Confidence: 0.954841612857143

00:44:43.130 --> 00:44:44.600 reasons that someone who's brain dead,

NOTE Confidence: 0.954841612857143

00:44:44.600 --> 00:44:47.638 who's still hooked up to a vent,

NOTE Confidence: 0.954841612857143

00:44:47.640 --> 00:44:48.531 doesn't look dead.

NOTE Confidence: 0.954841612857143

00:44:48.531 --> 00:44:50.313 Their chest is rising and falling.

NOTE Confidence: 0.954841612857143

00:44:50.320 --> 00:44:52.148 Their heart is beating.

NOTE Confidence: 0.954841612857143

00:44:52.148 --> 00:44:56.400 Their skin looks not Gray or or, you know,

NOTE Confidence: 0.954841612857143

00:44:56.400 --> 00:44:59.424 I mean they they look alive and they  
NOTE Confidence: 0.954841612857143

00:44:59.424 --> 00:45:02.583 sort of have to trust a Doctor Who  
NOTE Confidence: 0.954841612857143

00:45:02.583 --> 00:45:05.676 says that your loved one is is dead.  
NOTE Confidence: 0.954841612857143

00:45:05.680 --> 00:45:09.120 And many people in some cases for  
NOTE Confidence: 0.954841612857143

00:45:09.120 --> 00:45:10.320 very good historical reasons,  
NOTE Confidence: 0.954841612857143

00:45:10.320 --> 00:45:12.045 don't trust the doctors on  
NOTE Confidence: 0.954841612857143

00:45:12.045 --> 00:45:14.760 that kind of thing.  
NOTE Confidence: 0.954841612857143

00:45:14.760 --> 00:45:17.984 And in addition to that,  
NOTE Confidence: 0.954841612857143

00:45:17.984 --> 00:45:20.120 there have been several court challenges  
NOTE Confidence: 0.954841612857143

00:45:20.182 --> 00:45:22.528 around the United States that have  
NOTE Confidence: 0.954841612857143

00:45:22.528 --> 00:45:24.092 basically effectively shown that  
NOTE Confidence: 0.954841612857143

00:45:24.154 --> 00:45:26.562 many of the tests that are organized  
NOTE Confidence: 0.954841612857143

00:45:26.562 --> 00:45:28.986 by specialty societies to to test  
NOTE Confidence: 0.954841612857143

00:45:28.986 --> 00:45:31.758 for the presence of brain death  
NOTE Confidence: 0.954841612857143

00:45:31.760 --> 00:45:35.000 don't actually test for complete and  
NOTE Confidence: 0.954841612857143

00:45:35.000 --> 00:45:38.479 irreversible cessation of all brain function,



NOTE Confidence: 0.954841612857143

00:45:38.480 --> 00:45:40.912 including the brain stem.

NOTE Confidence: 0.954841612857143

00:45:40.912 --> 00:45:44.880 So many people have shown that

NOTE Confidence: 0.954841612857143

00:45:44.880 --> 00:45:46.570 particularly a lot of glandular

NOTE Confidence: 0.954841612857143

00:45:46.570 --> 00:45:48.638 function keeps on going after many

NOTE Confidence: 0.954841612857143

00:45:48.638 --> 00:45:50.243 people are actually declared brain

NOTE Confidence: 0.954841612857143

00:45:50.243 --> 00:45:52.626 dead and there's a bunch of isolated

NOTE Confidence: 0.954841612857143

00:45:52.626 --> 00:45:54.356 neuronal firing that's going on.

NOTE Confidence: 0.954841612857143

00:45:54.360 --> 00:45:55.800 So it doesn't mean that all

NOTE Confidence: 0.954841612857143

00:45:55.800 --> 00:45:56.760 the cells are dead.

NOTE Confidence: 0.954841612857143

00:45:56.760 --> 00:45:59.598 Is that continued function or not?

NOTE Confidence: 0.954841612857143

00:45:59.600 --> 00:46:00.085 Right.

NOTE Confidence: 0.954841612857143

00:46:00.085 --> 00:46:02.995 So there's a lot of controversy

NOTE Confidence: 0.954841612857143

00:46:03.000 --> 00:46:06.800 about brain death and about the

NOTE Confidence: 0.808637395714286

00:46:08.880 --> 00:46:10.272 UDDA, the Uniform Determination

NOTE Confidence: 0.808637395714286

00:46:10.272 --> 00:46:12.485 of Death Act, and a lot of people

NOTE Confidence: 0.808637395714286

00:46:12.485 --> 00:46:14.280 saying it needs to be revisited.  
NOTE Confidence: 0.808637395714286

00:46:14.280 --> 00:46:15.680 And our research, I think,  
NOTE Confidence: 0.808637395714286

00:46:15.680 --> 00:46:20.608 only adds to that pretty  
NOTE Confidence: 0.808637395714286

00:46:20.608 --> 00:46:22.400 serious contemporary problem for  
NOTE Confidence: 0.808637395714286

00:46:22.400 --> 00:46:24.640 bioethics and and and policy.  
NOTE Confidence: 0.956156082857143

00:46:31.920 --> 00:46:33.748 But there's another issue,  
NOTE Confidence: 0.956156082857143

00:46:33.748 --> 00:46:36.479 which is that sometimes brains that  
NOTE Confidence: 0.956156082857143

00:46:36.479 --> 00:46:39.733 you get to use in research come  
NOTE Confidence: 0.956156082857143

00:46:39.733 --> 00:46:42.398 from organizations that have simply  
NOTE Confidence: 0.956156082857143

00:46:42.398 --> 00:46:44.530 gotten someone's blanket consent  
NOTE Confidence: 0.956156082857143

00:46:44.605 --> 00:46:47.191 to donate their entire body for  
NOTE Confidence: 0.956156082857143

00:46:47.191 --> 00:46:49.280 medical research after they die.  
NOTE Confidence: 0.956156082857143

00:46:49.280 --> 00:46:53.636 And this is not a very well regulated area.  
NOTE Confidence: 0.956156082857143

00:46:53.640 --> 00:46:55.090 People who you might actually  
NOTE Confidence: 0.956156082857143

00:46:55.090 --> 00:46:56.528 just very recently, you might,  
NOTE Confidence: 0.956156082857143

00:46:56.528 --> 00:46:57.664 you might profitably watch

NOTE Confidence: 0.956156082857143

00:46:57.664 --> 00:46:58.800 John Oliver on this.

NOTE Confidence: 0.956156082857143

00:46:58.800 --> 00:47:01.120 He just had a piece come out on

NOTE Confidence: 0.956156082857143

00:47:01.120 --> 00:47:03.365 this like this week right there.

NOTE Confidence: 0.956156082857143

00:47:03.365 --> 00:47:07.112 There's a lot of problems because the

NOTE Confidence: 0.956156082857143

00:47:07.112 --> 00:47:10.232 quality of consent necessary to have

NOTE Confidence: 0.956156082857143

00:47:10.232 --> 00:47:12.528 your body used after you're dead is

NOTE Confidence: 0.956156082857143

00:47:12.528 --> 00:47:14.760 it's not the standards of informed consent.

NOTE Confidence: 0.956156082857143

00:47:14.760 --> 00:47:16.356 You don't have to fully understand everything

NOTE Confidence: 0.956156082857143

00:47:16.356 --> 00:47:17.797 that's going to go on to your body.

NOTE Confidence: 0.956156082857143

00:47:17.800 --> 00:47:18.480 You just sort of say,

NOTE Confidence: 0.956156082857143

00:47:18.480 --> 00:47:21.280 I am yielding my body to research

NOTE Confidence: 0.956156082857143

00:47:21.280 --> 00:47:22.960 and the people who receive the body

NOTE Confidence: 0.956156082857143

00:47:22.960 --> 00:47:24.856 are not well regulated and some of

NOTE Confidence: 0.956156082857143

00:47:24.856 --> 00:47:26.536 them are totally upright and doing

NOTE Confidence: 0.956156082857143

00:47:26.593 --> 00:47:28.153 things that you might expect if

NOTE Confidence: 0.956156082857143

00:47:28.153 --> 00:47:29.730 you donate your body to research.  
NOTE Confidence: 0.956156082857143

00:47:29.730 --> 00:47:32.290 And some of the some of them are doing  
NOTE Confidence: 0.956156082857143

00:47:32.290 --> 00:47:34.160 things that you wouldn't expect.  
NOTE Confidence: 0.956156082857143

00:47:34.160 --> 00:47:35.072 And for me,  
NOTE Confidence: 0.956156082857143

00:47:35.072 --> 00:47:36.592 if somebody donated their whole  
NOTE Confidence: 0.956156082857143

00:47:36.592 --> 00:47:37.800 body to research,  
NOTE Confidence: 0.956156082857143

00:47:37.800 --> 00:47:40.530 I would like it if they had  
NOTE Confidence: 0.956156082857143

00:47:40.530 --> 00:47:43.039 been told before they did that,  
NOTE Confidence: 0.956156082857143

00:47:43.040 --> 00:47:45.950 that their brain might be kept  
NOTE Confidence: 0.956156082857143

00:47:45.950 --> 00:47:47.890 metabolically functioning for a  
NOTE Confidence: 0.956156082857143

00:47:47.978 --> 00:47:51.708 week or two postmortem right now.  
NOTE Confidence: 0.956156082857143

00:47:51.708 --> 00:47:55.159 If we were to get a brain to do this,  
NOTE Confidence: 0.956156082857143

00:47:55.160 --> 00:47:57.545 get a human brain to do this kind of  
NOTE Confidence: 0.956156082857143

00:47:57.545 --> 00:47:59.494 research from one of these outfits  
NOTE Confidence: 0.956156082857143

00:47:59.494 --> 00:48:01.114 that that takes these things,  
NOTE Confidence: 0.956156082857143

00:48:01.120 --> 00:48:03.640 takes donations of bodies for research,

NOTE Confidence: 0.956156082857143  
00:48:03.640 --> 00:48:06.148 I don't think we'd be getting the kind  
NOTE Confidence: 0.956156082857143  
00:48:06.148 --> 00:48:09.156 of consent that I wish that we were getting.  
NOTE Confidence: 0.956156082857143  
00:48:09.156 --> 00:48:10.392 But that might require  
NOTE Confidence: 0.956156082857143  
00:48:10.392 --> 00:48:11.919 changes in laws and so on.  
NOTE Confidence: 0.956156082857143  
00:48:11.920 --> 00:48:12.679 I will say  
NOTE Confidence: 0.9572777375  
00:48:15.320 --> 00:48:18.260 the move to human brains from pig  
NOTE Confidence: 0.9572777375  
00:48:18.260 --> 00:48:20.825 brains is definitely happening  
NOTE Confidence: 0.9572777375  
00:48:20.825 --> 00:48:24.400 in our line of research,  
NOTE Confidence: 0.9572777375  
00:48:24.400 --> 00:48:27.358 and in some ways that's great.  
NOTE Confidence: 0.9572777375  
00:48:27.360 --> 00:48:29.340 For example, if you're getting  
NOTE Confidence: 0.9572777375  
00:48:29.340 --> 00:48:31.320 brains from people who consent,  
NOTE Confidence: 0.9572777375  
00:48:31.320 --> 00:48:32.368 that's my time up,  
NOTE Confidence: 0.9572777375  
00:48:32.368 --> 00:48:34.560 but I'll be done in just a second.  
NOTE Confidence: 0.9572777375  
00:48:34.560 --> 00:48:35.500 If you're getting brains  
NOTE Confidence: 0.9572777375  
00:48:35.500 --> 00:48:36.440 from people who consent,  
NOTE Confidence: 0.878927612857143

00:48:38.680 --> 00:48:40.311 you don't have any of the animal  
NOTE Confidence: 0.878927612857143

00:48:40.311 --> 00:48:41.837 ethics issues that you used to have,  
NOTE Confidence: 0.878927612857143

00:48:41.840 --> 00:48:43.360 right, 'cause people can understand,  
NOTE Confidence: 0.878927612857143

00:48:43.360 --> 00:48:44.224 oh, you know, you're going to  
NOTE Confidence: 0.878927612857143

00:48:44.224 --> 00:48:46.320 do this to my brain. That's OK.  
NOTE Confidence: 0.878927612857143

00:48:46.320 --> 00:48:50.160 And and they donate post mortem,  
NOTE Confidence: 0.878927612857143

00:48:50.160 --> 00:48:52.080 no humans will be killed for the research,  
NOTE Confidence: 0.878927612857143

00:48:52.080 --> 00:48:54.159 even though it might be the case  
NOTE Confidence: 0.878927612857143

00:48:54.159 --> 00:48:55.916 that the occasional pig might be  
NOTE Confidence: 0.878927612857143

00:48:55.916 --> 00:48:57.792 killed for the research and so on.  
NOTE Confidence: 0.878927612857143

00:48:57.800 --> 00:49:01.008 So there's there's ways in which moving into  
NOTE Confidence: 0.878927612857143

00:49:01.008 --> 00:49:04.036 the human world is an unethical relief.  
NOTE Confidence: 0.878927612857143

00:49:04.040 --> 00:49:07.352 If you're going to try to do this research,  
NOTE Confidence: 0.878927612857143

00:49:07.360 --> 00:49:09.682 what kinds of research can you do with a  
NOTE Confidence: 0.878927612857143

00:49:09.682 --> 00:49:12.077 human brain that's being sustained on this,  
NOTE Confidence: 0.878927612857143

00:49:12.080 --> 00:49:13.238 on this machinery?

NOTE Confidence: 0.90377015

00:49:15.920 --> 00:49:20.074 There's there's a functional brain bug,

NOTE Confidence: 0.90377015

00:49:20.074 --> 00:49:20.782 brain barrier.

NOTE Confidence: 0.90377015

00:49:20.782 --> 00:49:23.880 You can look at the way brains metabolize

NOTE Confidence: 0.90377015

00:49:23.880 --> 00:49:26.595 different kinds of potential drugs.

NOTE Confidence: 0.90377015

00:49:26.600 --> 00:49:29.032 You can test drugs in the brains of

NOTE Confidence: 0.90377015

00:49:29.032 --> 00:49:31.251 people who actually had the disease

NOTE Confidence: 0.90377015

00:49:31.251 --> 00:49:33.555 that you're testing the drug for.

NOTE Confidence: 0.90377015

00:49:33.560 --> 00:49:35.756 It's just a really amazing model.

NOTE Confidence: 0.90377015

00:49:35.760 --> 00:49:38.588 And as I said, you could do

NOTE Confidence: 0.90377015

00:49:38.588 --> 00:49:40.700 amazing brain mapping of a kind

NOTE Confidence: 0.90377015

00:49:40.700 --> 00:49:42.200 that's not been possible before.

NOTE Confidence: 0.971027834444444

00:49:45.960 --> 00:49:49.479 So then the last thing that I will mention,

NOTE Confidence: 0.971027834444444

00:49:49.480 --> 00:49:50.746 which is the thing that most

NOTE Confidence: 0.971027834444444

00:49:50.746 --> 00:49:51.837 people really think about when

NOTE Confidence: 0.971027834444444

00:49:51.837 --> 00:49:52.877 they first hear about this,

NOTE Confidence: 0.971027834444444

00:49:52.880 --> 00:49:55.680 is this problem of consciousness.  
NOTE Confidence: 0.9710278344444444

00:49:55.680 --> 00:49:59.496 I've told you that our perfusate  
NOTE Confidence: 0.9710278344444444

00:49:59.496 --> 00:50:02.040 doesn't permit neuronal firing.  
NOTE Confidence: 0.9710278344444444

00:50:02.040 --> 00:50:04.398 I would happily donate my brain  
NOTE Confidence: 0.9710278344444444

00:50:04.398 --> 00:50:06.366 to this research project because  
NOTE Confidence: 0.9710278344444444

00:50:06.366 --> 00:50:08.634 I know that it won't wake up.  
NOTE Confidence: 0.9710278344444444

00:50:08.640 --> 00:50:14.360 OK, I'm entirely, 110% confident of that.  
NOTE Confidence: 0.9710278344444444

00:50:14.360 --> 00:50:15.520 Why won't it wake up?  
NOTE Confidence: 0.9710278344444444

00:50:15.520 --> 00:50:18.076 Because we don't want it to.  
NOTE Confidence: 0.9710278344444444

00:50:18.080 --> 00:50:19.400 And by the way,  
NOTE Confidence: 0.9710278344444444

00:50:19.400 --> 00:50:21.050 Yale owns the intellectual property  
NOTE Confidence: 0.9710278344444444

00:50:21.050 --> 00:50:23.280 to the Perfusade and the Machine,  
NOTE Confidence: 0.9710278344444444

00:50:23.280 --> 00:50:25.552 and they're not going to license it to  
NOTE Confidence: 0.9710278344444444

00:50:25.552 --> 00:50:27.719 anybody who wants the brain to wake up.  
NOTE Confidence: 0.9315539475

00:50:30.040 --> 00:50:32.165 But if you tinkered with  
NOTE Confidence: 0.9315539475

00:50:32.165 --> 00:50:33.440 the perfusion formula



NOTE Confidence: 0.955148836

00:50:35.560 --> 00:50:39.622 and put in some sodium and changed

NOTE Confidence: 0.955148836

00:50:39.622 --> 00:50:40.959 it in a couple of other ways,

NOTE Confidence: 0.932070536153846

00:50:44.120 --> 00:50:46.574 is it possible that a perfused

NOTE Confidence: 0.932070536153846

00:50:46.574 --> 00:50:49.520 brain could wake up in the machine?

NOTE Confidence: 0.945479508

00:50:51.800 --> 00:50:52.448 We don't know.

NOTE Confidence: 0.945479508

00:50:52.448 --> 00:50:53.650 But yeah, it's probably.

NOTE Confidence: 0.945479508

00:50:53.650 --> 00:50:55.960 It might well be possible now.

NOTE Confidence: 0.945479508

00:50:55.960 --> 00:50:58.272 It might be that in the total absence

NOTE Confidence: 0.945479508

00:50:58.272 --> 00:51:00.958 of any sensory stimulation whatsoever,

NOTE Confidence: 0.945479508

00:51:00.960 --> 00:51:02.760 it would have no desire to wake up.

NOTE Confidence: 0.945479508

00:51:02.760 --> 00:51:04.440 It would not be motivated to wake up.

NOTE Confidence: 0.945479508

00:51:04.440 --> 00:51:05.139 Doesn't hear anything.

NOTE Confidence: 0.945479508

00:51:05.139 --> 00:51:06.095 Doesn't see anything. Right.

NOTE Confidence: 0.945479508

00:51:06.095 --> 00:51:07.880 But let's say it did wake up,

NOTE Confidence: 0.945479508

00:51:07.880 --> 00:51:09.116 then what would that be like?

NOTE Confidence: 0.945479508

00:51:09.120 --> 00:51:11.038 Would it be wondering where it was?  
NOTE Confidence: 0.945479508

00:51:11.040 --> 00:51:12.866 Would it be saying, oh damn,  
NOTE Confidence: 0.945479508

00:51:12.866 --> 00:51:15.634 I should never have signed that consent form?  
NOTE Confidence: 0.945479508

00:51:15.640 --> 00:51:16.918 Would it be having a dream?  
NOTE Confidence: 0.945479508

00:51:16.920 --> 00:51:18.880 Would it be having a panic attack?  
NOTE Confidence: 0.945479508

00:51:18.880 --> 00:51:20.710 What is a panic attack like  
NOTE Confidence: 0.945479508

00:51:20.710 --> 00:51:22.479 if you don't have a body,  
NOTE Confidence: 0.945479508

00:51:22.480 --> 00:51:25.776 what is a panic attack like if you  
NOTE Confidence: 0.945479508

00:51:25.776 --> 00:51:31.680 don't have breath and muscles, right?  
NOTE Confidence: 0.945479508

00:51:31.680 --> 00:51:32.672 And you might ask,  
NOTE Confidence: 0.945479508

00:51:32.672 --> 00:51:34.480 in connection with the animal ethics thing,  
NOTE Confidence: 0.945479508

00:51:34.480 --> 00:51:37.136 how would a pig brain waking up in  
NOTE Confidence: 0.945479508

00:51:37.136 --> 00:51:39.640 the VAT compare to the brain of a  
NOTE Confidence: 0.945479508

00:51:39.640 --> 00:51:42.070 pig that was used to model traumatic  
NOTE Confidence: 0.945479508

00:51:42.070 --> 00:51:44.520 brain injury for human beings?  
NOTE Confidence: 0.945479508

00:51:44.520 --> 00:51:46.536 I sort of feel like we're already

NOTE Confidence: 0.945479508

00:51:46.536 --> 00:51:48.505 doing much worse things to pigs

NOTE Confidence: 0.945479508

00:51:48.505 --> 00:51:50.235 than this would constitute doing,

NOTE Confidence: 0.945479508

00:51:50.240 --> 00:51:52.151 but I'm really also not sure of

NOTE Confidence: 0.945479508

00:51:52.151 --> 00:51:53.998 the moral status of that argument.

NOTE Confidence: 0.945479508

00:51:54.000 --> 00:51:55.760 I think it kind of assumes too much

NOTE Confidence: 0.945479508

00:51:55.760 --> 00:51:57.596 about what we're doing already being OK

NOTE Confidence: 0.968615445

00:52:02.400 --> 00:52:06.342 For my part, I think that I cannot

NOTE Confidence: 0.968615445

00:52:06.342 --> 00:52:08.928 imagine the research study that would

NOTE Confidence: 0.968615445

00:52:08.928 --> 00:52:10.665 justify inducing consciousness either

NOTE Confidence: 0.968615445

00:52:10.665 --> 00:52:13.486 in animals or in human brains that

NOTE Confidence: 0.968615445

00:52:13.486 --> 00:52:15.879 are hooked up to these machines.

NOTE Confidence: 0.968615445

00:52:15.880 --> 00:52:17.383 The kinds of things that I think about when

NOTE Confidence: 0.968615445

00:52:17.383 --> 00:52:18.997 I think about who would want to do that,

NOTE Confidence: 0.968615445

00:52:19.000 --> 00:52:21.624 I think about there's some characters

NOTE Confidence: 0.968615445

00:52:21.624 --> 00:52:23.640 out there who want to do brain

NOTE Confidence: 0.968615445

00:52:23.693 --> 00:52:25.890 transplants so they can move someone's

NOTE Confidence: 0.968615445

00:52:25.890 --> 00:52:27.880 brain into a non disabled body.

NOTE Confidence: 0.968615445

00:52:27.880 --> 00:52:29.704 I think that's an an illegitimate

NOTE Confidence: 0.968615445

00:52:29.704 --> 00:52:32.019 medical goal and I would oppose using

NOTE Confidence: 0.968615445

00:52:32.019 --> 00:52:34.434 this kind of technology to support that.

NOTE Confidence: 0.968615445

00:52:34.440 --> 00:52:35.958 On those reasons,

NOTE Confidence: 0.968615445

00:52:35.958 --> 00:52:37.476 there are transhumanists.

NOTE Confidence: 0.968615445

00:52:37.480 --> 00:52:39.636 I hear from them all the time.

NOTE Confidence: 0.968615445

00:52:39.640 --> 00:52:42.076 They want their because they're so,

NOTE Confidence: 0.968615445

00:52:42.080 --> 00:52:44.078 I guess because they're so important.

NOTE Confidence: 0.968615445

00:52:44.080 --> 00:52:46.824 They want their brains to be kept alive

NOTE Confidence: 0.968615445

00:52:46.824 --> 00:52:49.477 on machines for a really long time until

NOTE Confidence: 0.968615445

00:52:49.477 --> 00:52:52.160 we can supply them with robotic bodies.

NOTE Confidence: 0.968615445

00:52:52.160 --> 00:52:54.477 So they can just go on forever.

NOTE Confidence: 0.900355092222222

00:52:57.360 --> 00:52:58.780 And I don't think that's

NOTE Confidence: 0.900355092222222

00:52:58.780 --> 00:52:59.916 a legitimate goal either.

NOTE Confidence: 0.900355092222222

00:52:59.920 --> 00:53:04.085 And and then maybe if somebody were

NOTE Confidence: 0.900355092222222

00:53:04.085 --> 00:53:08.000 trying to create brain machine interfaces,

NOTE Confidence: 0.900355092222222

00:53:08.000 --> 00:53:11.389 maybe that would be a reason to

NOTE Confidence: 0.900355092222222

00:53:11.389 --> 00:53:13.160 allow a brain into that to wake up.

NOTE Confidence: 0.900355092222222

00:53:13.160 --> 00:53:14.912 But I actually think you'd probably

NOTE Confidence: 0.900355092222222

00:53:14.912 --> 00:53:16.591 do that much more effectively

NOTE Confidence: 0.900355092222222

00:53:16.591 --> 00:53:18.399 with living human volunteers.

NOTE Confidence: 0.900355092222222

00:53:18.400 --> 00:53:21.024 So I don't see any reasons at the

NOTE Confidence: 0.900355092222222

00:53:21.024 --> 00:53:23.960 moment to allow consciousness to occur.

NOTE Confidence: 0.929150966666667

00:53:27.240 --> 00:53:29.999 So I guess my quick conclusion, and I'm late.

NOTE Confidence: 0.752574028

00:53:32.200 --> 00:53:34.880 Neuroethics is its own field.

NOTE Confidence: 0.752574028

00:53:34.880 --> 00:53:37.001 It needs the space and the specialty

NOTE Confidence: 0.752574028

00:53:37.001 --> 00:53:38.600 journals that is carved out.

NOTE Confidence: 0.752574028

00:53:38.600 --> 00:53:41.399 It needs experts.

NOTE Confidence: 0.752574028

00:53:41.400 --> 00:53:45.620 I am not one, but many of the

NOTE Confidence: 0.752574028

00:53:45.620 --> 00:53:47.300 problems that neuroethics faces

NOTE Confidence: 0.752574028

00:53:47.300 --> 00:53:50.028 are entirely common with problems

NOTE Confidence: 0.752574028

00:53:50.028 --> 00:53:52.336 that non specialty bioethicists

NOTE Confidence: 0.752574028

00:53:52.336 --> 00:53:54.758 like myself face every day.

NOTE Confidence: 0.752574028

00:53:54.760 --> 00:53:56.596 And we can inform those debates.

NOTE Confidence: 0.752574028

00:53:56.600 --> 00:53:59.296 Some few are on their own and really

NOTE Confidence: 0.752574028

00:53:59.296 --> 00:54:01.190 need specialty people who understand

NOTE Confidence: 0.752574028

00:54:01.190 --> 00:54:03.488 the science in order to address

NOTE Confidence: 0.752574028

00:54:03.488 --> 00:54:07.570 them and and the problem of live

NOTE Confidence: 0.752574028

00:54:07.570 --> 00:54:10.057 brain research in ex vivo brains.

NOTE Confidence: 0.752574028

00:54:10.057 --> 00:54:13.506 I think the main ones that we face

NOTE Confidence: 0.752574028

00:54:13.506 --> 00:54:16.439 are the is the question of would

NOTE Confidence: 0.752574028

00:54:16.439 --> 00:54:20.040 it ever be legitimate in the future

NOTE Confidence: 0.752574028

00:54:20.040 --> 00:54:23.428 to permit a brain to experience

NOTE Confidence: 0.752574028

00:54:23.428 --> 00:54:26.113 or even to risk experiencing

NOTE Confidence: 0.752574028

00:54:26.113 --> 00:54:27.919 consciousness in this state.

NOTE Confidence: 0.752574028  
00:54:27.920 --> 00:54:29.050 What kind of consent would  
NOTE Confidence: 0.752574028  
00:54:29.050 --> 00:54:30.519 we need for that and so on.  
NOTE Confidence: 0.6868490175  
00:54:32.960 --> 00:54:34.600 Questions. Right. Mark. Yeah.  
NOTE Confidence: 0.446223225555556  
00:54:41.720 --> 00:54:45.797 So if you wanted, you can have a seat.  
NOTE Confidence: 0.706450754444444  
00:54:44.040 --> 00:54:44.588 You can stand however  
NOTE Confidence: 0.706450754444444  
00:54:44.588 --> 00:54:45.400 you want to do this. And  
NOTE Confidence: 0.638833408  
00:54:45.800 --> 00:54:47.840 I'll look here I've got a this is,  
NOTE Confidence: 0.638833408  
00:54:47.840 --> 00:54:49.533 this is on. So I can set Michael.  
NOTE Confidence: 0.638833408  
00:54:49.533 --> 00:54:50.960 Work. Is that working?  
NOTE Confidence: 0.82641275  
00:54:51.400 --> 00:54:53.480 Yeah. So that works.  
NOTE Confidence: 0.82641275  
00:54:53.480 --> 00:54:55.780 So I invite your questions and folks,  
NOTE Confidence: 0.82641275  
00:54:55.780 --> 00:54:57.600 Karen will eventually bring me a laptop  
NOTE Confidence: 0.856660203333333  
00:54:57.600 --> 00:54:58.956 up and we'll work with that.  
NOTE Confidence: 0.92801845625  
00:55:00.000 --> 00:55:02.205 First, I just wanted to let you  
NOTE Confidence: 0.92801845625  
00:55:02.205 --> 00:55:03.440 know that I heard from the guys  
NOTE Confidence: 0.92801845625

00:55:03.440 --> 00:55:04.880 in my club during the talk,  
NOTE Confidence: 0.97092735

00:55:06.480 --> 00:55:08.945 the big guys and and here's The thing is  
NOTE Confidence: 0.97092735

00:55:08.945 --> 00:55:11.720 we are large guys, we're affectionate,  
NOTE Confidence: 0.80154085

00:55:11.720 --> 00:55:13.640 we like the hug. So just be aware,  
NOTE Confidence: 0.80154085

00:55:13.640 --> 00:55:15.759 should any of you choose to throw  
NOTE Confidence: 0.80154085

00:55:15.760 --> 00:55:20.120 any of us off the bridge. OK,  
NOTE Confidence: 0.49798825

00:55:20.120 --> 00:55:21.880 Just be aware you're coming  
NOTE Confidence: 0.49798825

00:55:21.880 --> 00:55:23.718 with us. OK. All right.  
NOTE Confidence: 0.598064276363636

00:55:23.720 --> 00:55:24.836 Just so just so we're just  
NOTE Confidence: 0.598064276363636

00:55:24.836 --> 00:55:25.840 so we're clear on that.  
NOTE Confidence: 0.954356318571429

00:55:26.080 --> 00:55:27.412 I thought that was a fascinating  
NOTE Confidence: 0.954356318571429

00:55:27.412 --> 00:55:28.558 talk, a lovely overview,  
NOTE Confidence: 0.871529166666667

00:55:28.840 --> 00:55:32.302 as well as of course very tantalizing  
NOTE Confidence: 0.871529166666667

00:55:32.302 --> 00:55:34.136 talk on the on the cutting edge  
NOTE Confidence: 0.871529166666667

00:55:34.136 --> 00:55:35.810 stuff that's been going on the last  
NOTE Confidence: 0.871529166666667

00:55:35.810 --> 00:55:37.520 couple years over in the main campus.



NOTE Confidence: 0.871529166666667  
00:55:37.520 --> 00:55:39.478 So there's, there's much to talk about.  
NOTE Confidence: 0.871529166666667  
00:55:39.480 --> 00:55:42.520 So let's start, Please wait one  
NOTE Confidence: 0.7899539775  
00:55:42.520 --> 00:55:43.960 second. I nearly forgot.  
NOTE Confidence: 0.7899539775  
00:55:43.960 --> 00:55:45.400 We got to do this properly so  
NOTE Confidence: 0.7899539775  
00:55:45.400 --> 00:55:47.560 that the people on Zoom can  
NOTE Confidence: 0.7899539775  
00:55:47.560 --> 00:55:50.439 hear and also there we go.  
NOTE Confidence: 0.758958926666667  
00:55:50.640 --> 00:55:53.034 Thank you. So please do wait until you have  
NOTE Confidence: 0.758958926666667  
00:55:53.034 --> 00:55:54.714 a mic so the folks on Zoom could hear and  
NOTE Confidence: 0.758958926666667  
00:55:54.720 --> 00:55:56.952 also so that everyone in the room could  
NOTE Confidence: 0.758958926666667  
00:55:56.952 --> 00:55:58.232 hear You hold it up nice and close so  
NOTE Confidence: 0.758958926666667  
00:55:58.232 --> 00:55:59.320 it doesn't work like you. Really. Yeah.  
NOTE Confidence: 0.795907835  
00:55:59.480 --> 00:56:00.230 So interesting talk.  
NOTE Confidence: 0.795907835  
00:56:00.230 --> 00:56:02.880 I just want to ask you a quick question.  
NOTE Confidence: 0.795907835  
00:56:02.880 --> 00:56:05.274 So I don't know how many billion  
NOTE Confidence: 0.795907835  
00:56:05.274 --> 00:56:07.120 neurons a pig brain has.  
NOTE Confidence: 0.795907835

00:56:07.120 --> 00:56:09.556 The human has about 100 billion,  
NOTE Confidence: 0.795907835

00:56:09.560 --> 00:56:10.720 of which there's enormous  
NOTE Confidence: 0.795907835

00:56:10.720 --> 00:56:13.656 variability in susceptibility  
NOTE Confidence: 0.795907835

00:56:13.656 --> 00:56:15.880 to oxygen deprivation, right.  
NOTE Confidence: 0.795907835

00:56:15.880 --> 00:56:19.520 So you you, you made the assertion  
NOTE Confidence: 0.795907835

00:56:19.520 --> 00:56:22.559 that these neurons were alive.  
NOTE Confidence: 0.795907835

00:56:22.560 --> 00:56:26.160 And it's unclear to me how you made that  
NOTE Confidence: 0.795907835

00:56:26.160 --> 00:56:28.320 assertion and how much you're sampling,  
NOTE Confidence: 0.795907835

00:56:28.320 --> 00:56:30.510 because you're saying there's no neuronal  
NOTE Confidence: 0.795907835

00:56:30.510 --> 00:56:32.400 activity because there's no sodium.  
NOTE Confidence: 0.795907835

00:56:32.400 --> 00:56:33.768 And yet you're seeing,  
NOTE Confidence: 0.795907835

00:56:33.768 --> 00:56:35.136 you're saying you can  
NOTE Confidence: 0.795907835

00:56:35.136 --> 00:56:36.720 measure that they're alive.  
NOTE Confidence: 0.829306415

00:56:39.040 --> 00:56:40.360 What do you mean by that?  
NOTE Confidence: 0.829306415

00:56:40.360 --> 00:56:42.976 Yeah, a couple of ways.  
NOTE Confidence: 0.829306415

00:56:42.976 --> 00:56:44.640 When you take them out of the brain,

NOTE Confidence: 0.829306415

00:56:44.640 --> 00:56:47.830 they twitch. How many?

NOTE Confidence: 0.829306415

00:56:47.830 --> 00:56:50.875 How many cells do you look at?

NOTE Confidence: 0.829306415

00:56:50.880 --> 00:56:53.616 It is not 100% of the cells that

NOTE Confidence: 0.829306415

00:56:53.616 --> 00:56:55.600 recover from ischemic damage.

NOTE Confidence: 0.829306415

00:56:55.600 --> 00:56:57.000 And how many cells?

NOTE Confidence: 0.9347340933333333

00:56:59.480 --> 00:57:02.000 I don't know. You have to read the

NOTE Confidence: 0.9347340933333333

00:57:02.000 --> 00:57:04.238 Nature cover story that ran in 2019.

NOTE Confidence: 0.9347340933333333

00:57:04.240 --> 00:57:06.464 That was the first one to talk about

NOTE Confidence: 0.9347340933333333

00:57:06.464 --> 00:57:08.025 the restoration of metabolic and

NOTE Confidence: 0.9347340933333333

00:57:08.025 --> 00:57:09.915 cellular function in the pig brains.

NOTE Confidence: 0.9347340933333333

00:57:09.920 --> 00:57:11.796 The exact numbers are in that article,

NOTE Confidence: 0.9347340933333333

00:57:11.800 --> 00:57:13.200 but I don't know them.

NOTE Confidence: 0.9347340933333333

00:57:13.200 --> 00:57:15.888 But my general impression of the

NOTE Confidence: 0.9347340933333333

00:57:15.888 --> 00:57:19.312 result is that it was a small minority

NOTE Confidence: 0.9347340933333333

00:57:19.312 --> 00:57:22.120 of cells that had not survived

NOTE Confidence: 0.9347340933333333

00:57:22.120 --> 00:57:26.000 the hour and had not been revived.  
NOTE Confidence: 0.9347340933333333

00:57:26.000 --> 00:57:28.163 And one of the major ways that  
NOTE Confidence: 0.9347340933333333

00:57:28.163 --> 00:57:30.599 you can tell this is by comparing  
NOTE Confidence: 0.9347340933333333

00:57:30.600 --> 00:57:32.040 controlled brains that  
NOTE Confidence: 0.916854936428572

00:57:34.560 --> 00:57:37.045 in live pigs, by measuring input and  
NOTE Confidence: 0.916854936428572

00:57:37.045 --> 00:57:39.960 output in the vasculature of live pigs,  
NOTE Confidence: 0.916854936428572

00:57:39.960 --> 00:57:42.725 to the brains in the machinery and  
NOTE Confidence: 0.916854936428572

00:57:42.725 --> 00:57:45.578 looking at the amount of oxygen and  
NOTE Confidence: 0.916854936428572

00:57:45.578 --> 00:57:48.588 glucose that is taken in and used and  
NOTE Confidence: 0.916854936428572

00:57:48.588 --> 00:57:50.412 the amount that comes out at the other  
NOTE Confidence: 0.916854936428572

00:57:50.412 --> 00:57:52.475 end after having gone through the brain.  
NOTE Confidence: 0.916854936428572

00:57:52.480 --> 00:57:55.028 Right. So you're looking at what goes  
NOTE Confidence: 0.916854936428572

00:57:55.028 --> 00:57:57.695 into the brain and what comes out of  
NOTE Confidence: 0.916854936428572

00:57:57.695 --> 00:58:00.320 the brain in terms of food and waste.  
NOTE Confidence: 0.916854936428572

00:58:00.320 --> 00:58:02.854 And what my understanding of what they  
NOTE Confidence: 0.916854936428572

00:58:02.854 --> 00:58:05.961 saw in the 1st paper was that very

NOTE Confidence: 0.916854936428572  
00:58:05.961 --> 00:58:09.580 rapidly the brain began behaving in a way  
NOTE Confidence: 0.916854936428572  
00:58:09.580 --> 00:58:12.802 that was completely characteristic of a  
NOTE Confidence: 0.916854936428572  
00:58:12.802 --> 00:58:16.057 traumatized brain in a living animal, right.  
NOTE Confidence: 0.916854936428572  
00:58:16.057 --> 00:58:18.010 So it was acting like an injured brain in  
NOTE Confidence: 0.916854936428572  
00:58:18.058 --> 00:58:19.754 terms of how much material it was taking  
NOTE Confidence: 0.916854936428572  
00:58:19.754 --> 00:58:21.680 in and how much cell it was giving out,  
NOTE Confidence: 0.916854936428572  
00:58:21.680 --> 00:58:23.542 more than the usual amount of cellular  
NOTE Confidence: 0.916854936428572  
00:58:23.542 --> 00:58:25.254 waste because it's trying to clear out  
NOTE Confidence: 0.916854936428572  
00:58:25.254 --> 00:58:26.920 some of the stuff from the damage.  
NOTE Confidence: 0.916854936428572  
00:58:26.920 --> 00:58:29.576 And then by the end of the multiple  
NOTE Confidence: 0.916854936428572  
00:58:29.576 --> 00:58:31.080 hours of perfusion,  
NOTE Confidence: 0.916854936428572  
00:58:31.080 --> 00:58:33.649 it was looking more like a normal  
NOTE Confidence: 0.916854936428572  
00:58:33.649 --> 00:58:36.182 brain in terms of how the whole  
NOTE Confidence: 0.916854936428572  
00:58:36.182 --> 00:58:39.640 brain is metabolizing material.  
NOTE Confidence: 0.916854936428572  
00:58:39.640 --> 00:58:42.188 I think there's much better and much  
NOTE Confidence: 0.916854936428572

00:58:42.188 --> 00:58:44.007 more detailed information now that  
NOTE Confidence: 0.916854936428572

00:58:44.007 --> 00:58:45.677 hasn't yet been published because  
NOTE Confidence: 0.916854936428572

00:58:45.677 --> 00:58:47.917 these days the lab is keeping the  
NOTE Confidence: 0.916854936428572

00:58:47.917 --> 00:58:49.985 brains going for a week at a time  
NOTE Confidence: 0.916854936428572

00:58:49.985 --> 00:58:51.640 rather than for hours at a time.  
NOTE Confidence: 0.90972155

00:58:55.800 --> 00:58:56.240 Please.  
NOTE Confidence: 0.897288718333333

00:59:03.920 --> 00:59:06.116 Hi. Thank you for the talk.  
NOTE Confidence: 0.897288718333333

00:59:06.120 --> 00:59:08.040 I'm curious like what what  
NOTE Confidence: 0.897288718333333

00:59:08.040 --> 00:59:09.890 kind of evidence or response  
NOTE Confidence: 0.897288718333333

00:59:09.890 --> 00:59:11.720 might convince you that a brain  
NOTE Confidence: 0.789570746666667

00:59:11.720 --> 00:59:13.958 or a system has become conscious?  
NOTE Confidence: 0.789570746666667

00:59:13.960 --> 00:59:15.220 And then maybe even a more pressing  
NOTE Confidence: 0.789570746666667

00:59:15.220 --> 00:59:16.756 question like what what kind of evidence  
NOTE Confidence: 0.95873718

00:59:16.760 --> 00:59:19.119 would convince you that we should start,  
NOTE Confidence: 0.799908155714286

00:59:19.320 --> 00:59:21.196 like to be safer, to be ethical,  
NOTE Confidence: 0.799908155714286

00:59:21.200 --> 00:59:22.316 like we should act as if

NOTE Confidence: 0.911712927777778

00:59:22.360 --> 00:59:24.439 it's conscious just to be just to be safe?

NOTE Confidence: 0.86251536

00:59:29.680 --> 00:59:32.880 I I think the baseline would be some

NOTE Confidence: 0.86251536

00:59:32.880 --> 00:59:37.439 kind of network neuronal firing.

NOTE Confidence: 0.86251536

00:59:37.440 --> 00:59:38.917 We know that in people who have

NOTE Confidence: 0.86251536

00:59:38.917 --> 00:59:40.600 been diagnosed brain death, we see

NOTE Confidence: 0.86251536

00:59:40.600 --> 00:59:42.880 isolated neurons firing here and there.

NOTE Confidence: 0.86251536

00:59:42.880 --> 00:59:49.680 That doesn't give rise to experience.

NOTE Confidence: 0.86251536

00:59:49.680 --> 00:59:52.535 And we have, you know, pretty,

NOTE Confidence: 0.86251536

00:59:52.535 --> 00:59:55.440 pretty good understanding of the kinds of

NOTE Confidence: 0.86251536

00:59:55.440 --> 00:59:58.743 the way that the way that network firing

NOTE Confidence: 0.86251536

00:59:58.743 --> 01:00:01.439 looks in certain kinds of situations.

NOTE Confidence: 0.86251536

01:00:01.440 --> 01:00:03.312 And I think we'd need to

NOTE Confidence: 0.86251536

01:00:03.312 --> 01:00:04.560 detect something like that.

NOTE Confidence: 0.86251536

01:00:04.560 --> 01:00:08.740 But again, in the research that's

NOTE Confidence: 0.86251536

01:00:08.740 --> 01:00:10.880 currently being done at Yale,

NOTE Confidence: 0.86251536

01:00:10.880 --> 01:00:13.244 the perfusate doesn't allow  
NOTE Confidence: 0.86251536

01:00:13.244 --> 01:00:16.199 any neuronal firing at all.  
NOTE Confidence: 0.86251536

01:00:16.200 --> 01:00:18.983 It allows the neurons to feed  
NOTE Confidence: 0.86251536

01:00:18.983 --> 01:00:21.041 themselves and take in oxygen and  
NOTE Confidence: 0.86251536

01:00:21.041 --> 01:00:22.719 expel cellular waste and so on,  
NOTE Confidence: 0.86251536

01:00:22.720 --> 01:00:24.918 but it doesn't allow them to fire.  
NOTE Confidence: 0.86251536

01:00:24.920 --> 01:00:28.200 So in that circumstance,  
NOTE Confidence: 0.86251536

01:00:28.200 --> 01:00:30.280 there's there's not anything there.  
NOTE Confidence: 0.86251536

01:00:30.280 --> 01:00:31.820 But if if you,  
NOTE Confidence: 0.86251536

01:00:31.820 --> 01:00:34.544 if you were to set up the perfusase  
NOTE Confidence: 0.86251536

01:00:34.544 --> 01:00:36.320 so that neuronal firing was possible,  
NOTE Confidence: 0.86251536

01:00:36.320 --> 01:00:39.645 then you'd be looking for some kind  
NOTE Confidence: 0.86251536

01:00:39.645 --> 01:00:42.519 of organized network firing activity.  
NOTE Confidence: 0.86251536

01:00:42.520 --> 01:00:43.840 What would count as the place  
NOTE Confidence: 0.86251536

01:00:43.840 --> 01:00:45.048 where you would say, oh,  
NOTE Confidence: 0.86251536

01:00:45.048 --> 01:00:47.672 now is the time to shut this off.



NOTE Confidence: 0.86251536

01:00:47.680 --> 01:00:49.640 I don't know enough about,

NOTE Confidence: 0.86251536

01:00:49.640 --> 01:00:52.041 but I actually think that there are

NOTE Confidence: 0.86251536

01:00:52.041 --> 01:00:53.752 some neuroscientists out there who

NOTE Confidence: 0.86251536

01:00:53.752 --> 01:00:55.915 know an awful lot about what different

NOTE Confidence: 0.86251536

01:00:55.915 --> 01:00:57.999 kinds of states of awareness or

NOTE Confidence: 0.86251536

01:00:57.999 --> 01:00:59.714 experience or sensation look like.

NOTE Confidence: 0.7003217

01:01:02.360 --> 01:01:07.125 So I want to push back on one of the on

NOTE Confidence: 0.7003217

01:01:07.125 --> 01:01:10.360 a fundamental premise this whole thing.

NOTE Confidence: 0.7003217

01:01:10.360 --> 01:01:13.620 Just so I'm clear on this, We as a society,

NOTE Confidence: 0.7003217

01:01:13.620 --> 01:01:16.676 we as a species have long ago decided

NOTE Confidence: 0.7003217

01:01:16.676 --> 01:01:20.000 and we as a society still accept with

NOTE Confidence: 0.7003217

01:01:20.000 --> 01:01:24.600 a notable minority who feel otherwise.

NOTE Confidence: 0.7003217

01:01:24.600 --> 01:01:26.392 We have a society accept the fact

NOTE Confidence: 0.7003217

01:01:26.392 --> 01:01:29.644 that one can take a pig and put it

NOTE Confidence: 0.7003217

01:01:29.644 --> 01:01:32.440 in a little tiny pen forever, right?

NOTE Confidence: 0.7003217

01:01:32.440 --> 01:01:33.730 And then when we're finally done  
NOTE Confidence: 0.7003217

01:01:33.730 --> 01:01:34.840 growing to a certain size,  
NOTE Confidence: 0.7003217

01:01:34.840 --> 01:01:38.040 we can then slaughter it, OK, and eat it.  
NOTE Confidence: 0.7003217

01:01:38.040 --> 01:01:39.493 Now many people,  
NOTE Confidence: 0.7003217

01:01:39.493 --> 01:01:41.200 including some good friends of mine,  
NOTE Confidence: 0.7003217

01:01:41.200 --> 01:01:42.839 would say, well that's the wrong thing to do.  
NOTE Confidence: 0.7003217

01:01:42.840 --> 01:01:45.063 But the fact of the matter is this is  
NOTE Confidence: 0.7003217

01:01:45.063 --> 01:01:46.960 widely practiced throughout the world,  
NOTE Confidence: 0.7003217

01:01:46.960 --> 01:01:48.920 has been throughout human history.  
NOTE Confidence: 0.7003217

01:01:48.920 --> 01:01:51.691 So I'm actually a little bit it  
NOTE Confidence: 0.7003217

01:01:51.691 --> 01:01:53.840 it doesn't quite pass for me the  
NOTE Confidence: 0.7003217

01:01:53.840 --> 01:01:54.840 straight face test to say,  
NOTE Confidence: 0.7003217

01:01:54.840 --> 01:01:56.880 hang on a second,  
NOTE Confidence: 0.879457011666667

01:01:55.640 --> 01:01:56.880 we're going to take this pig. We're going  
NOTE Confidence: 0.5911008366

01:01:56.880 --> 01:01:59.040 to just treat it in for lots of better worth,  
NOTE Confidence: 0.5911008366

01:01:59.040 --> 01:02:01.060 these incredibly cruel circumstances

NOTE Confidence: 0.5911008366

01:02:01.060 --> 01:02:03.080 throughout its entire existence.

NOTE Confidence: 0.5911008366

01:02:03.080 --> 01:02:03.997 But geez, we're not going to let

NOTE Confidence: 0.5911008366

01:02:04.000 --> 01:02:05.360 that brain wake up for a couple days,

NOTE Confidence: 0.5911008366

01:02:05.360 --> 01:02:07.546 because that would really be me to me.

NOTE Confidence: 0.5911008366

01:02:07.546 --> 01:02:09.492 What might be happening to

NOTE Confidence: 0.5911008366

01:02:09.492 --> 01:02:11.320 that brain for that six hours

NOTE Confidence: 0.973175015

01:02:11.320 --> 01:02:15.412 or seven days now has got to

NOTE Confidence: 0.973175015

01:02:15.412 --> 01:02:17.880 be infinitesimally trivial

NOTE Confidence: 0.973175015

01:02:17.880 --> 01:02:19.920 compared to the experience that

NOTE Confidence: 0.973175015

01:02:19.920 --> 01:02:21.400 Pig had throughout his life.

NOTE Confidence: 0.95402422

01:02:21.960 --> 01:02:23.760 So I'm fascinated that there

NOTE Confidence: 0.95402422

01:02:23.760 --> 01:02:25.200 has been such resistance.

NOTE Confidence: 0.95402422

01:02:25.200 --> 01:02:27.692 Some people I'm amazed we took the

NOTE Confidence: 0.95402422

01:02:27.692 --> 01:02:30.552 salt out of the perfusate that there

NOTE Confidence: 0.95402422

01:02:30.552 --> 01:02:32.204 isn't more interest in seeing if they

NOTE Confidence: 0.95402422

01:02:32.204 --> 01:02:34.005 can create that and and to me to say  
NOTE Confidence: 0.95402422

01:02:34.005 --> 01:02:35.773 that well this is this is because to  
NOTE Confidence: 0.95402422

01:02:35.773 --> 01:02:38.320 do so would be unkind to the pig,  
NOTE Confidence: 0.95402422

01:02:38.320 --> 01:02:40.120 to me that strange credulity  
NOTE Confidence: 0.95402422

01:02:40.120 --> 01:02:42.900 given the rest of the pig and Full  
NOTE Confidence: 0.95402422

01:02:42.900 --> 01:02:44.678 disclosure I eaten my share of pigs.  
NOTE Confidence: 0.95402422

01:02:44.680 --> 01:02:49.797 OK, but as most people in the room have.  
NOTE Confidence: 0.95402422

01:02:49.800 --> 01:02:51.828 But is there honestly a feeling  
NOTE Confidence: 0.95402422

01:02:51.828 --> 01:02:52.713 that we can't do this?  
NOTE Confidence: 0.95402422

01:02:52.720 --> 01:02:54.040 Because it would be unethical  
NOTE Confidence: 0.808942745714286

01:02:54.160 --> 01:02:56.757 for this pig brain to experiencing something  
NOTE Confidence: 0.808942745714286

01:02:56.760 --> 01:02:58.039 totally disregarding everything he's  
NOTE Confidence: 0.808942745714286

01:02:58.040 --> 01:03:02.080 experienced for its entire existence?  
NOTE Confidence: 0.808942745714286

01:03:02.080 --> 01:03:06.965 Two things. One is there are a lot of  
NOTE Confidence: 0.808942745714286

01:03:06.965 --> 01:03:08.650 people very close to all the members  
NOTE Confidence: 0.808942745714286

01:03:08.650 --> 01:03:10.402 of the research community who are

NOTE Confidence: 0.808942745714286  
01:03:10.402 --> 01:03:11.918 really worried about the premise.  
NOTE Confidence: 0.808942745714286  
01:03:11.920 --> 01:03:13.282 Like maybe we shouldn't be treating  
NOTE Confidence: 0.808942745714286  
01:03:13.282 --> 01:03:14.519 those pigs that way at all.  
NOTE Confidence: 0.808942745714286  
01:03:14.520 --> 01:03:16.080 Maybe that is fundamentally wrong.  
NOTE Confidence: 0.808942745714286  
01:03:16.080 --> 01:03:18.896 And if that's fundamentally wrong, you know,  
NOTE Confidence: 0.808942745714286  
01:03:18.896 --> 01:03:20.632 why should our little world be different?  
NOTE Confidence: 0.808942745714286  
01:03:20.640 --> 01:03:23.088 Why should we use the horribleness  
NOTE Confidence: 0.808942745714286  
01:03:23.088 --> 01:03:25.902 of Agri business to justify our  
NOTE Confidence: 0.808942745714286  
01:03:25.902 --> 01:03:27.420 own horribleness, right?  
NOTE Confidence: 0.808942745714286  
01:03:27.420 --> 01:03:29.520 That's one kind of response.  
NOTE Confidence: 0.953566166  
01:03:31.840 --> 01:03:35.260 Another kind of response is anything  
NOTE Confidence: 0.953566166  
01:03:35.260 --> 01:03:36.800 you do with a pig brain today,  
NOTE Confidence: 0.953566166  
01:03:36.800 --> 01:03:40.120 you might do with a human brain tomorrow.  
NOTE Confidence: 0.953566166  
01:03:40.120 --> 01:03:44.038 And there is therefore some reasonable  
NOTE Confidence: 0.89813164  
01:03:47.080 --> 01:03:52.040 prudential argument for not facilitating,  
NOTE Confidence: 0.89813164

01:03:52.040 --> 01:03:54.584 not creating the technology that might  
NOTE Confidence: 0.89813164

01:03:54.584 --> 01:03:58.312 allow us to do things that we find  
NOTE Confidence: 0.89813164

01:03:58.312 --> 01:04:00.752 fairly appalling with human brains.  
NOTE Confidence: 0.89813164

01:04:00.760 --> 01:04:02.542 Right. There's that kind of slippery  
NOTE Confidence: 0.89813164

01:04:02.542 --> 01:04:04.718 slope argument is is out there as well,  
NOTE Confidence: 0.93273227

01:04:07.840 --> 01:04:09.800 and those things, and  
NOTE Confidence: 0.87739041875

01:04:15.840 --> 01:04:18.040 maybe this isn't an ethical statement at all.  
NOTE Confidence: 0.87739041875

01:04:18.040 --> 01:04:22.600 This is just kind of a a a statement of fact.  
NOTE Confidence: 0.87739041875

01:04:22.600 --> 01:04:24.440 There's nothing as far as I know,  
NOTE Confidence: 0.87739041875

01:04:24.440 --> 01:04:27.452 there's nothing that Ceston lab or  
NOTE Confidence: 0.87739041875

01:04:27.452 --> 01:04:29.932 that the Bexorg spin off company  
NOTE Confidence: 0.87739041875

01:04:29.932 --> 01:04:31.552 that's trying to commercialize some  
NOTE Confidence: 0.87739041875

01:04:31.552 --> 01:04:33.519 of the Ceston Labs techniques.  
NOTE Confidence: 0.87739041875

01:04:33.520 --> 01:04:35.014 There's nothing that we want to  
NOTE Confidence: 0.87739041875

01:04:35.014 --> 01:04:36.840 do with big brains that would be  
NOTE Confidence: 0.87739041875

01:04:36.840 --> 01:04:38.400 assisted by having them be awake.

NOTE Confidence: 0.960762602857143  
01:04:40.720 --> 01:04:45.074 So if we can do our science  
NOTE Confidence: 0.960762602857143  
01:04:45.080 --> 01:04:47.980 without even coming close to  
NOTE Confidence: 0.960762602857143  
01:04:47.980 --> 01:04:50.880 stepping on an ethical landmine,  
NOTE Confidence: 0.960762602857143  
01:04:50.880 --> 01:04:51.840 that's what we want to do.  
NOTE Confidence: 0.88355393  
01:04:53.880 --> 01:04:54.759 Got it? I  
NOTE Confidence: 0.955770275  
01:04:54.760 --> 01:04:56.410 have a question from someone in  
NOTE Confidence: 0.955770275  
01:04:56.410 --> 01:04:58.986 the Zoom world who says could  
NOTE Confidence: 0.955770275  
01:04:58.986 --> 01:05:00.638 you characterize the control?  
NOTE Confidence: 0.955770275  
01:05:00.640 --> 01:05:01.560 I'm soon we're talking about  
NOTE Confidence: 0.955770275  
01:05:01.560 --> 01:05:02.480 the pig experiments here again.  
NOTE Confidence: 0.955770275  
01:05:02.480 --> 01:05:04.285 Could you characterize the control  
NOTE Confidence: 0.955770275  
01:05:04.285 --> 01:05:06.560 conditions in a little more detail?  
NOTE Confidence: 0.955770275  
01:05:06.560 --> 01:05:07.640 What are the control conditions  
NOTE Confidence: 0.840239641  
01:05:07.640 --> 01:05:10.160 you referred to the control conditions  
NOTE Confidence: 0.840239641  
01:05:10.160 --> 01:05:12.720 for the 1st paper where that we were  
NOTE Confidence: 0.739567938333333

01:05:14.840 --> 01:05:18.186 comparing a perfused the brain that was  
NOTE Confidence: 0.739567938333333

01:05:18.186 --> 01:05:21.444 being perfused with our perfusate to a  
NOTE Confidence: 0.739567938333333

01:05:21.444 --> 01:05:24.180 a brain that was not being perfused and  
NOTE Confidence: 0.739567938333333

01:05:24.258 --> 01:05:27.378 just comparing the conditions and the  
NOTE Confidence: 0.739567938333333

01:05:27.378 --> 01:05:30.319 ischemic damage that happened over time.  
NOTE Confidence: 0.739567938333333

01:05:30.320 --> 01:05:33.850 And we also had considerable measurements  
NOTE Confidence: 0.739567938333333

01:05:33.850 --> 01:05:36.075 about the activities of brains.  
NOTE Confidence: 0.739567938333333

01:05:36.080 --> 01:05:39.720 And you would not believe how well  
NOTE Confidence: 0.739567938333333

01:05:39.720 --> 01:05:42.424 mapped out the contours of pig  
NOTE Confidence: 0.739567938333333

01:05:42.424 --> 01:05:44.920 brains have been by Agri business.  
NOTE Confidence: 0.739567938333333

01:05:44.920 --> 01:05:47.510 They know what EEGS and pig brains  
NOTE Confidence: 0.739567938333333

01:05:47.510 --> 01:05:49.690 look like when pigs are hungry.  
NOTE Confidence: 0.739567938333333

01:05:49.690 --> 01:05:51.760 They know what Eegs look like.  
NOTE Confidence: 0.739567938333333

01:05:51.760 --> 01:05:53.164 And pigs that have been hurt  
NOTE Confidence: 0.739567938333333

01:05:53.164 --> 01:05:54.640 by being hit in the head,  
NOTE Confidence: 0.739567938333333

01:05:54.640 --> 01:05:57.672 they know what pigs brains EEG readouts look



NOTE Confidence: 0.739567938333333  
01:05:57.672 --> 01:06:00.056 like when pigs want to have sex, right.  
NOTE Confidence: 0.739567938333333  
01:06:00.056 --> 01:06:02.200 It's incredibly well mapped.  
NOTE Confidence: 0.739567938333333  
01:06:02.200 --> 01:06:03.880 So we had access to all that  
NOTE Confidence: 0.739567938333333  
01:06:03.880 --> 01:06:04.600 kind of literature,  
NOTE Confidence: 0.739567938333333  
01:06:04.600 --> 01:06:07.358 but we also had controlled brains that  
NOTE Confidence: 0.739567938333333  
01:06:07.358 --> 01:06:10.000 were just being allowed to degrade.  
NOTE Confidence: 0.739567938333333  
01:06:10.000 --> 01:06:10.930 And the reason,  
NOTE Confidence: 0.739567938333333  
01:06:10.930 --> 01:06:12.790 my understanding of the reason for  
NOTE Confidence: 0.739567938333333  
01:06:12.790 --> 01:06:14.997 why we stopped in the first article,  
NOTE Confidence: 0.739567938333333  
01:06:15.000 --> 01:06:16.585 why we stopped reporting about  
NOTE Confidence: 0.739567938333333  
01:06:16.585 --> 01:06:18.799 what was going on in hour six,  
NOTE Confidence: 0.739567938333333  
01:06:18.800 --> 01:06:20.460 was that the controlled brain  
NOTE Confidence: 0.739567938333333  
01:06:20.460 --> 01:06:22.506 at that point was just useless  
NOTE Confidence: 0.739567938333333  
01:06:22.506 --> 01:06:24.436 and not creating any data.  
NOTE Confidence: 0.739567938333333  
01:06:24.440 --> 01:06:27.398 It didn't just turn to mush.  
NOTE Confidence: 0.739567938333333

01:06:27.400 --> 01:06:27.720 So we're  
NOTE Confidence: 0.801825464117647

01:06:28.080 --> 01:06:29.552 looking at serial, presumably  
NOTE Confidence: 0.801825464117647

01:06:29.552 --> 01:06:31.024 serial Histology and watching  
NOTE Confidence: 0.801825464117647

01:06:31.024 --> 01:06:32.475 the necrosis progress until  
NOTE Confidence: 0.801825464117647

01:06:32.475 --> 01:06:34.120 the point until it's liquefied  
NOTE Confidence: 0.780774711428571

01:06:34.120 --> 01:06:37.480 or looking at the conditions of  
NOTE Confidence: 0.780774711428571

01:06:37.480 --> 01:06:40.320 cells at different points in time  
NOTE Confidence: 0.780774711428571

01:06:40.320 --> 01:06:43.540 and looking at input and output from  
NOTE Confidence: 0.780774711428571

01:06:43.540 --> 01:06:46.800 the perfused brains. Yeah, Thank you.  
NOTE Confidence: 0.43717775

01:06:49.360 --> 01:06:53.360 So I think like we can all think of like  
NOTE Confidence: 0.43717775

01:06:53.360 --> 01:06:55.986 10 people at least who would pay 50 to  
NOTE Confidence: 0.43717775

01:06:55.986 --> 01:06:58.472 \$100 billion for this technology, right.  
NOTE Confidence: 0.43717775

01:06:58.472 --> 01:07:00.858 And and will, I mean the the patent's only  
NOTE Confidence: 0.43717775

01:07:00.858 --> 01:07:02.744 going to last for like 20 years, right.  
NOTE Confidence: 0.43717775

01:07:02.744 --> 01:07:05.120 And they will 18 now or something like that,  
NOTE Confidence: 0.43717775

01:07:05.120 --> 01:07:08.704 Yeah. But leaving aside that those folks,

NOTE Confidence: 0.43717775

01:07:08.704 --> 01:07:11.433 it seems to me that that there are like a

NOTE Confidence: 0.43717775

01:07:11.433 --> 01:07:15.140 a number of like very legitimate uses I I

NOTE Confidence: 0.43717775

01:07:15.140 --> 01:07:19.558 can think of for for this technology in,

NOTE Confidence: 0.43717775

01:07:19.560 --> 01:07:21.600 you know, life saving medical care

NOTE Confidence: 0.43717775

01:07:21.600 --> 01:07:24.445 for humans. So you know the number

NOTE Confidence: 0.43717775

01:07:24.445 --> 01:07:26.746 one killer in in the developed world

NOTE Confidence: 0.43717775

01:07:26.746 --> 01:07:28.222 is heart disease, right?

NOTE Confidence: 0.43717775

01:07:28.222 --> 01:07:32.016 And you have potentially here a technology

NOTE Confidence: 0.43717775

01:07:32.016 --> 01:07:36.388 that could restore life to a brain after

NOTE Confidence: 0.43717775

01:07:36.388 --> 01:07:39.370 a catastrophic cardiac event, right?

NOTE Confidence: 0.43717775

01:07:39.370 --> 01:07:43.520 And and allow, you know,

NOTE Confidence: 0.43717775

01:07:43.520 --> 01:07:45.200 intervention and treatment

NOTE Confidence: 0.43717775

01:07:45.200 --> 01:07:48.000 potentially even like you know,

NOTE Confidence: 0.43717775

01:07:48.000 --> 01:07:52.095 heart transplant to repair the cardiac injury

NOTE Confidence: 0.43717775

01:07:52.095 --> 01:07:53.920 and the person could go on with their life,

NOTE Confidence: 0.43717775

01:07:53.920 --> 01:07:56.524 you know, in their body if you  
NOTE Confidence: 0.43717775

01:07:56.524 --> 01:07:58.480 could just restart the brain.  
NOTE Confidence: 0.43717775

01:07:58.480 --> 01:08:01.000 I mean that that I can,  
NOTE Confidence: 0.43717775

01:08:01.000 --> 01:08:03.264 I can multiply the examples of the ways  
NOTE Confidence: 0.43717775

01:08:03.264 --> 01:08:05.660 that this could be used clinically the  
NOTE Confidence: 0.43717775

01:08:05.660 --> 01:08:08.244 the perfusate itself since it is very  
NOTE Confidence: 0.43717775

01:08:08.244 --> 01:08:10.638 good at keeping very complex organs alive.  
NOTE Confidence: 0.43717775

01:08:10.640 --> 01:08:12.386 It's like a substitute blood and  
NOTE Confidence: 0.43717775

01:08:12.386 --> 01:08:14.519 it might well help with transplant.  
NOTE Confidence: 0.43717775

01:08:14.520 --> 01:08:16.880 You might be able to take organs from  
NOTE Confidence: 0.43717775

01:08:16.880 --> 01:08:18.719 someone who's a donor and hook them  
NOTE Confidence: 0.43717775

01:08:18.719 --> 01:08:20.650 up to a a perfusion machine that's  
NOTE Confidence: 0.43717775

01:08:20.650 --> 01:08:22.696 been customized for that kind of  
NOTE Confidence: 0.43717775

01:08:22.696 --> 01:08:24.600 organ and fly it across the country,  
NOTE Confidence: 0.43717775

01:08:24.600 --> 01:08:26.665 fly it around the world and use  
NOTE Confidence: 0.43717775

01:08:26.665 --> 01:08:28.040 it for transplant exists.

NOTE Confidence: 0.43717775  
01:08:28.040 --> 01:08:30.200 You do that for kidneys,  
NOTE Confidence: 0.43717775  
01:08:30.200 --> 01:08:31.600 you do that for livers and so on.  
NOTE Confidence: 0.43717775  
01:08:31.600 --> 01:08:34.270 And that's how these guys derive  
NOTE Confidence: 0.43717775  
01:08:34.270 --> 01:08:35.864 the solution to food.  
NOTE Confidence: 0.43717775  
01:08:35.864 --> 01:08:37.120 There's a derivation of the  
NOTE Confidence: 0.593779457692308  
01:08:39.280 --> 01:08:40.580 previous solution that had for  
NOTE Confidence: 0.593779457692308  
01:08:40.580 --> 01:08:42.439 kidneys and livers and so on that has  
NOTE Confidence: 0.8548316675  
01:08:44.520 --> 01:08:45.654 been around for long. I'll have  
NOTE Confidence: 0.8548316675  
01:08:45.654 --> 01:08:46.800 to take your word for that.  
NOTE Confidence: 0.909877844444445  
01:08:49.760 --> 01:08:52.280 Although I do know that we had a  
NOTE Confidence: 0.909877844444445  
01:08:52.280 --> 01:08:54.640 study of whole body perfusion with our  
NOTE Confidence: 0.909877844444445  
01:08:54.640 --> 01:08:56.885 perfusate that compared it to ECMO and  
NOTE Confidence: 0.909877844444445  
01:08:56.885 --> 01:09:01.106 it performed better than ECMO at support  
NOTE Confidence: 0.909877844444445  
01:09:01.106 --> 01:09:04.640 of organs across a whole deceased pig.  
NOTE Confidence: 0.892286631111111  
01:09:06.760 --> 01:09:08.960 But right it might have  
NOTE Confidence: 0.892286631111111

01:09:08.960 --> 01:09:10.720 applications for for transplant.  
NOTE Confidence: 0.8922866311111111

01:09:10.720 --> 01:09:14.041 And also the perfusate is a cellular so it  
NOTE Confidence: 0.8922866311111111

01:09:14.041 --> 01:09:17.078 carries oxygen without any red blood cells.  
NOTE Confidence: 0.8922866311111111

01:09:17.080 --> 01:09:19.520 And that means if somebody's had a stroke,  
NOTE Confidence: 0.8922866311111111

01:09:19.520 --> 01:09:21.840 which is in in the form of, you know,  
NOTE Confidence: 0.8922866311111111

01:09:21.840 --> 01:09:25.040 a sieve in a capillary in the brain,  
NOTE Confidence: 0.8922866311111111

01:09:25.040 --> 01:09:26.825 Perfuse 8 might be able to carry  
NOTE Confidence: 0.8922866311111111

01:09:26.825 --> 01:09:28.452 oxygen through the sieve to the  
NOTE Confidence: 0.8922866311111111

01:09:28.452 --> 01:09:29.797 downstream parts of the brain.  
NOTE Confidence: 0.8922866311111111

01:09:29.800 --> 01:09:34.324 There are many possible medical applications,  
NOTE Confidence: 0.8922866311111111

01:09:34.324 --> 01:09:37.834 but those don't require consciousness  
NOTE Confidence: 0.8922866311111111

01:09:37.840 --> 01:09:39.960 and they're being licensed out.  
NOTE Confidence: 0.8922866311111111

01:09:39.960 --> 01:09:42.070 Yale owns the intellectual property  
NOTE Confidence: 0.8922866311111111

01:09:42.070 --> 01:09:45.043 to the Perfuse 8 and machinery and  
NOTE Confidence: 0.8922866311111111

01:09:45.043 --> 01:09:48.142 the the labs here and also Bexorg are  
NOTE Confidence: 0.8922866311111111

01:09:48.142 --> 01:09:49.510 partnering with research universities

NOTE Confidence: 0.8922866311111111  
01:09:49.510 --> 01:09:52.410 around the world to try to work on  
NOTE Confidence: 0.8922866311111111  
01:09:52.410 --> 01:09:53.914 developing those clinical applications.  
NOTE Confidence: 0.8922866311111111  
01:09:53.920 --> 01:09:54.952 Including, you know,  
NOTE Confidence: 0.8922866311111111  
01:09:54.952 --> 01:09:57.360 trying to bring someone back who's had,  
NOTE Confidence: 0.8922866311111111  
01:09:57.360 --> 01:09:59.100 who's not breathed 'cause they had  
NOTE Confidence: 0.8922866311111111  
01:09:59.100 --> 01:10:01.096 a heart attack in a swimming pool  
NOTE Confidence: 0.8922866311111111  
01:10:01.096 --> 01:10:02.895 1/2 hour ago that that kind of  
NOTE Confidence: 0.8922866311111111  
01:10:02.954 --> 01:10:04.796 stuff is definitely on the table.  
NOTE Confidence: 0.8922866311111111  
01:10:04.800 --> 01:10:06.753 But, but specifically,  
NOTE Confidence: 0.8922866311111111  
01:10:06.753 --> 01:10:09.912 restoration of consciousness after 10  
NOTE Confidence: 0.8922866311111111  
01:10:09.912 --> 01:10:14.040 minutes or an hour of death would be,  
NOTE Confidence: 0.8922866311111111  
01:10:14.040 --> 01:10:17.800 you know, a medical miracle, right?  
NOTE Confidence: 0.8922866311111111  
01:10:17.800 --> 01:10:18.272 Like that.  
NOTE Confidence: 0.8922866311111111  
01:10:18.272 --> 01:10:19.688 That seems to me like something  
NOTE Confidence: 0.8922866311111111  
01:10:19.688 --> 01:10:20.160 worth investigating.  
NOTE Confidence: 0.954229138461538

01:10:29.080 --> 01:10:31.866 Yeah. I think the way that you  
NOTE Confidence: 0.954229138461538

01:10:31.866 --> 01:10:34.079 would investigate it would be via  
NOTE Confidence: 0.954229138461538

01:10:34.080 --> 01:10:37.716 emergency room applications because  
NOTE Confidence: 0.954229138461538

01:10:37.716 --> 01:10:42.180 we know that it can do some reversal  
NOTE Confidence: 0.954229138461538

01:10:42.284 --> 01:10:44.360 of ischemic damage in the brain  
NOTE Confidence: 0.954229138461538

01:10:44.360 --> 01:10:45.992 and restore metabolic function.  
NOTE Confidence: 0.954229138461538

01:10:45.992 --> 01:10:48.802 And I think the way you would  
NOTE Confidence: 0.954229138461538

01:10:48.802 --> 01:10:51.340 do it is you would try it out in  
NOTE Confidence: 0.954229138461538

01:10:51.417 --> 01:10:53.453 people who otherwise would die  
NOTE Confidence: 0.954229138461538

01:10:53.453 --> 01:10:56.039 and see if it restores function.  
NOTE Confidence: 0.954229138461538

01:10:56.040 --> 01:10:57.097 And then you run into the thing  
NOTE Confidence: 0.954229138461538

01:10:57.097 --> 01:10:58.522 that I already mentioned, the talk,  
NOTE Confidence: 0.954229138461538

01:10:58.522 --> 01:11:00.629 which is that you could have a  
NOTE Confidence: 0.954229138461538

01:11:00.629 --> 01:11:02.630 therapy that restores function but  
NOTE Confidence: 0.954229138461538

01:11:02.630 --> 01:11:05.078 doesn't restore great quality of life.  
NOTE Confidence: 0.954229138461538

01:11:05.080 --> 01:11:07.828 I'm not sure what would what the



NOTE Confidence: 0.954229138461538  
01:11:07.828 --> 01:11:10.026 additional gain would be to show that  
NOTE Confidence: 0.954229138461538  
01:11:10.026 --> 01:11:12.517 it it wakes up the brain in the VAT.  
NOTE Confidence: 0.954229138461538  
01:11:12.520 --> 01:11:13.222 Why that?  
NOTE Confidence: 0.954229138461538  
01:11:13.222 --> 01:11:16.030 Why you would want to do that before  
NOTE Confidence: 0.954229138461538  
01:11:16.115 --> 01:11:18.240 you try to apply it to someone whose  
NOTE Confidence: 0.954229138461538  
01:11:18.240 --> 01:11:20.039 other option is death in the ER,  
NOTE Confidence: 0.86943010625  
01:11:23.520 --> 01:11:24.255 Yeah, no, sorry.  
NOTE Confidence: 0.86943010625  
01:11:24.255 --> 01:11:25.866 My question was just making sure that  
NOTE Confidence: 0.86943010625  
01:11:25.866 --> 01:11:27.171 you were saying a little bit louder,  
NOTE Confidence: 0.86943010625  
01:11:27.171 --> 01:11:28.480 a little bit closer, if you would.  
NOTE Confidence: 0.86943010625  
01:11:28.480 --> 01:11:29.452 My question was just making  
NOTE Confidence: 0.86943010625  
01:11:29.452 --> 01:11:30.960 sure that you were saying that  
NOTE Confidence: 0.86943010625  
01:11:30.960 --> 01:11:32.560 you would go like straight  
NOTE Confidence: 0.622747718  
01:11:32.560 --> 01:11:36.480 from brain about not not like awake  
NOTE Confidence: 0.622747718  
01:11:36.480 --> 01:11:39.960 to testing on humans to see if that  
NOTE Confidence: 0.964040844

01:11:39.960 --> 01:11:41.520 would awake. And you don't see  
NOTE Confidence: 0.964040844

01:11:41.520 --> 01:11:44.760 a benefit to like trying out  
NOTE Confidence: 0.878684077142857

01:11:44.760 --> 01:11:47.357 that on a like, pig brain before  
NOTE Confidence: 0.878684077142857

01:11:47.360 --> 01:11:50.160 heading over to like 'cause like,  
NOTE Confidence: 0.878684077142857

01:11:50.160 --> 01:11:51.895 I guess I I I don't know,  
NOTE Confidence: 0.878684077142857

01:11:51.895 --> 01:11:52.715 I don't know enough.  
NOTE Confidence: 0.878684077142857

01:11:52.720 --> 01:11:55.144 But wouldn't you be able to  
NOTE Confidence: 0.878684077142857

01:11:55.144 --> 01:11:57.760 sort of tell if you aren't  
NOTE Confidence: 0.940840502

01:11:57.760 --> 01:11:59.904 regaining function that is  
NOTE Confidence: 0.940840502

01:11:59.904 --> 01:12:03.240 conducive to any quality of life  
NOTE Confidence: 0.798965637777778

01:12:03.280 --> 01:12:07.159 in a brain of that before you got to  
NOTE Confidence: 0.798965637777778

01:12:07.160 --> 01:12:11.040 doing that in life, like live humans?  
NOTE Confidence: 0.798965637777778

01:12:11.040 --> 01:12:13.236 I'd say I don't know the answer to that.  
NOTE Confidence: 0.743672781111111

01:12:16.280 --> 01:12:18.638 So yeah, I I I don't know how much,  
NOTE Confidence: 0.910707094

01:12:22.400 --> 01:12:27.280 how well, again, the brain is  
NOTE Confidence: 0.910707094

01:12:27.280 --> 01:12:30.080 disembodied on the perfusion machine.

NOTE Confidence: 0.910707094

01:12:30.080 --> 01:12:33.760 It is not getting any sensory information.

NOTE Confidence: 0.910707094

01:12:33.760 --> 01:12:36.951 It's not clear to me that the awake

NOTE Confidence: 0.910707094

01:12:36.951 --> 01:12:39.450 brain in the machine is a decent

NOTE Confidence: 0.910707094

01:12:39.533 --> 01:12:42.182 model for somebody who's lying there

NOTE Confidence: 0.910707094

01:12:42.182 --> 01:12:45.260 in a whole body with arms and legs

NOTE Confidence: 0.910707094

01:12:45.260 --> 01:12:48.077 and eyes and ears and a nose, right?

NOTE Confidence: 0.910707094

01:12:48.077 --> 01:12:51.573 It's not clear to me that whatever you

NOTE Confidence: 0.910707094

01:12:51.573 --> 01:12:54.188 would see in the perfusion context

NOTE Confidence: 0.910707094

01:12:54.188 --> 01:12:57.212 would be a decent map of what you

NOTE Confidence: 0.910707094

01:12:57.212 --> 01:12:58.676 would see in the emergency department

NOTE Confidence: 0.910707094

01:12:58.676 --> 01:13:00.358 if you restored metabolic function to

NOTE Confidence: 0.910707094

01:13:00.358 --> 01:13:02.360 the brain of someone who was injured.

NOTE Confidence: 0.959208664

01:13:04.960 --> 01:13:08.088 It's not clear to me how great

NOTE Confidence: 0.959208664

01:13:08.088 --> 01:13:10.512 the value would be of adding

NOTE Confidence: 0.959208664

01:13:10.512 --> 01:13:13.540 that step before trying it out,

NOTE Confidence: 0.959208664

01:13:13.540 --> 01:13:15.700 especially with patients who  
NOTE Confidence: 0.959208664

01:13:15.700 --> 01:13:17.280 otherwise we would give up on.  
NOTE Confidence: 0.88457509

01:13:20.280 --> 01:13:23.420 Steve, a question and this  
NOTE Confidence: 0.88457509

01:13:23.420 --> 01:13:25.640 is this is on some Physiology  
NOTE Confidence: 0.8981273075

01:13:25.640 --> 01:13:26.732 going on here. I think in  
NOTE Confidence: 0.8981273075

01:13:26.732 --> 01:13:27.460 reference to your description  
NOTE Confidence: 0.8981273075

01:13:27.502 --> 01:13:28.600 perhaps of some of the potential,  
NOTE Confidence: 0.8981273075

01:13:28.600 --> 01:13:29.770 how is the connectivity of the  
NOTE Confidence: 0.8981273075

01:13:29.770 --> 01:13:32.400 brain maps without neurons firing?  
NOTE Confidence: 0.961922302857143

01:13:38.120 --> 01:13:39.924 Because neurons are connected  
NOTE Confidence: 0.961922302857143

01:13:39.924 --> 01:13:41.277 in permanent pathways,  
NOTE Confidence: 0.961922302857143

01:13:41.280 --> 01:13:43.080 even if they're not firing.  
NOTE Confidence: 0.961922302857143

01:13:43.080 --> 01:13:45.162 There is something like you can  
NOTE Confidence: 0.961922302857143

01:13:45.162 --> 01:13:47.438 imagine the Google Maps of the brain,  
NOTE Confidence: 0.961922302857143

01:13:47.440 --> 01:13:50.919 and there are certain kinds of markers,  
NOTE Confidence: 0.961922302857143

01:13:50.920 --> 01:13:51.868 viral markers mainly,

NOTE Confidence: 0.961922302857143

01:13:51.868 --> 01:13:54.687 that if you put them in a brain

NOTE Confidence: 0.961922302857143

01:13:54.687 --> 01:13:56.839 that is metabolically functioning,

NOTE Confidence: 0.961922302857143

01:13:56.840 --> 01:13:59.680 will spread from cell to cell in the

NOTE Confidence: 0.961922302857143

01:13:59.680 --> 01:14:01.640 pathway that those cells are connected to.

NOTE Confidence: 0.961922302857143

01:14:01.640 --> 01:14:03.158 So for example, you you can

NOTE Confidence: 0.48985848

01:14:05.600 --> 01:14:05.800 do that

NOTE Confidence: 0.908961159333333

01:14:08.680 --> 01:14:11.812 not in the same way and not at this

NOTE Confidence: 0.908961159333333

01:14:11.812 --> 01:14:14.400 single cell to single cell level.

NOTE Confidence: 0.908961159333333

01:14:14.400 --> 01:14:18.249 But I believe that in the next six

NOTE Confidence: 0.908961159333333

01:14:18.249 --> 01:14:20.220 months you will see a publication

NOTE Confidence: 0.908961159333333

01:14:20.220 --> 01:14:22.260 that shows that the kind of brain

NOTE Confidence: 0.908961159333333

01:14:22.260 --> 01:14:24.095 mapping I'm talking about is not

NOTE Confidence: 0.908961159333333

01:14:24.095 --> 01:14:25.397 currently available anywhere.

NOTE Confidence: 0.4758157

01:14:27.680 --> 01:14:28.920 Thank you. Yeah, this gentleman.

NOTE Confidence: 0.4758157

01:14:28.920 --> 01:14:30.624 It does seem to me that there

NOTE Confidence: 0.4758157

01:14:30.624 --> 01:14:33.106 are some potential clinical  
NOTE Confidence: 0.4758157

01:14:33.106 --> 01:14:35.280 applications of this technology that  
NOTE Confidence: 0.9640505725

01:14:35.360 --> 01:14:40.240 would require inducing consciousness.  
NOTE Confidence: 0.9640505725

01:14:40.240 --> 01:14:41.304 It seems to me that we might  
NOTE Confidence: 0.9640505725

01:14:41.304 --> 01:14:42.840 be able to make some advance.  
NOTE Confidence: 0.9640505725

01:14:42.840 --> 01:14:44.560 And I'm not a I'm not a psychiatrist,  
NOTE Confidence: 0.9640505725

01:14:44.560 --> 01:14:45.128 I'm not a neurologist.  
NOTE Confidence: 0.9640505725

01:14:45.128 --> 01:14:46.640 But it does seem to me that we can make some  
NOTE Confidence: 0.910991822

01:14:46.640 --> 01:14:47.960 advances in the field of,  
NOTE Confidence: 0.910991822

01:14:47.960 --> 01:14:49.640 for example, mental health care  
NOTE Confidence: 0.97334047

01:14:50.400 --> 01:14:51.840 if we are able to  
NOTE Confidence: 0.96751374

01:14:53.960 --> 01:14:56.720 somehow experiment on these brains in a VAT,  
NOTE Confidence: 0.96751374

01:14:56.720 --> 01:14:59.678 so to speak, that are conscious  
NOTE Confidence: 0.96751374

01:14:59.680 --> 01:15:03.800 now without any sensory input.  
NOTE Confidence: 0.96751374

01:15:03.800 --> 01:15:08.056 But could we? Could we not?  
NOTE Confidence: 0.96751374

01:15:08.056 --> 01:15:09.944 I mean, yeah, I think so.

NOTE Confidence: 0.96751374  
01:15:09.944 --> 01:15:11.480 When these people say to me,  
NOTE Confidence: 0.96751374  
01:15:11.480 --> 01:15:15.197 I want to upload my brain into a computer,  
NOTE Confidence: 0.96751374  
01:15:15.200 --> 01:15:18.080 I part of my response to them is,  
NOTE Confidence: 0.96751374  
01:15:18.080 --> 01:15:19.990 what's your plan for Tuesday  
NOTE Confidence: 0.96751374  
01:15:19.990 --> 01:15:21.518 morning with no body?  
NOTE Confidence: 0.96751374  
01:15:21.520 --> 01:15:24.556 Yeah, right. I I, I really,  
NOTE Confidence: 0.96751374  
01:15:24.560 --> 01:15:27.158 I I feel like the disembodied,  
NOTE Confidence: 0.96751374  
01:15:27.160 --> 01:15:28.210 like one of the things  
NOTE Confidence: 0.96751374  
01:15:28.210 --> 01:15:29.520 that I mean when I say,  
NOTE Confidence: 0.96751374  
01:15:29.520 --> 01:15:31.680 hey, the pig is dead,  
NOTE Confidence: 0.96751374  
01:15:31.680 --> 01:15:34.638 even though we've got its brain  
NOTE Confidence: 0.96751374  
01:15:34.640 --> 01:15:36.920 metabolically going in our lab,  
NOTE Confidence: 0.96751374  
01:15:36.920 --> 01:15:38.760 that pig is dead, right.  
NOTE Confidence: 0.96751374  
01:15:38.760 --> 01:15:40.638 I think we are much more  
NOTE Confidence: 0.93695724  
01:15:43.600 --> 01:15:44.640 embodied  
NOTE Confidence: 0.820649366153846

01:15:46.800 --> 01:15:49.565 than we than people who are very  
NOTE Confidence: 0.820649366153846

01:15:49.565 --> 01:15:51.918 concerned with brains often reckon on  
NOTE Confidence: 0.618405508333333

01:15:54.640 --> 01:15:56.476 anyway. But I, I interrupted you.  
NOTE Confidence: 0.618405508333333

01:15:56.480 --> 01:15:58.928 Yeah. No, I I, I, you know,  
NOTE Confidence: 0.618405508333333

01:15:58.928 --> 01:16:00.160 I don't know if we need sensory  
NOTE Confidence: 0.90945145625

01:16:00.160 --> 01:16:01.570 input per SE to look at  
NOTE Confidence: 0.90945145625

01:16:01.570 --> 01:16:02.680 those things. Because in,  
NOTE Confidence: 0.720962784

01:16:02.680 --> 01:16:04.400 I mean in in theory, right.  
NOTE Confidence: 0.720962784

01:16:04.400 --> 01:16:06.080 A a conscious disembodied  
NOTE Confidence: 0.720962784

01:16:06.080 --> 01:16:07.480 brain will still carry with  
NOTE Confidence: 0.719774451428571

01:16:07.480 --> 01:16:09.100 it its memories, right.  
NOTE Confidence: 0.719774451428571

01:16:09.100 --> 01:16:11.336 And its experiences. And I don't  
NOTE Confidence: 0.719774451428571

01:16:11.336 --> 01:16:12.620 know I'm making this up, right.  
NOTE Confidence: 0.719774451428571

01:16:12.620 --> 01:16:13.720 This is all science fiction.  
NOTE Confidence: 0.632961943333333

01:16:13.840 --> 01:16:15.076 We have to, I don't know,  
NOTE Confidence: 0.632961943333333

01:16:15.080 --> 01:16:16.800 talk to them about them,



NOTE Confidence: 0.6329619433333333

01:16:16.800 --> 01:16:19.400 figure out what they were,

NOTE Confidence: 0.6329619433333333

01:16:19.400 --> 01:16:20.906 stimulate particular memories,

NOTE Confidence: 0.6329619433333333

01:16:20.906 --> 01:16:23.918 all in a completely disembodied model.

NOTE Confidence: 0.6329619433333333

01:16:23.920 --> 01:16:27.799 I I, I don't, I don't really see it.

NOTE Confidence: 0.6329619433333333

01:16:27.800 --> 01:16:28.520 So depending

NOTE Confidence: 0.86389965

01:16:28.520 --> 01:16:30.354 on how much of the brain you

NOTE Confidence: 0.86389965

01:16:30.354 --> 01:16:31.960 take out, of course it's it's

NOTE Confidence: 0.9691178575

01:16:32.320 --> 01:16:34.440 quite possible to get

NOTE Confidence: 0.947461328

01:16:34.440 --> 01:16:37.760 stimuli into a brain just through

NOTE Confidence: 0.947461328

01:16:37.760 --> 01:16:39.479 cranial nerves, for example,

NOTE Confidence: 0.4963730433333333

01:16:41.160 --> 01:16:42.240 or auditory. I mean there are,

NOTE Confidence: 0.4963730433333333

01:16:42.240 --> 01:16:44.610 there are people who are building

NOTE Confidence: 0.4963730433333333

01:16:44.610 --> 01:16:46.570 brain organoids that they're trying

NOTE Confidence: 0.4963730433333333

01:16:46.570 --> 01:16:48.520 to connect to sensory organs.

NOTE Confidence: 0.470306828571429

01:16:52.800 --> 01:16:54.720 Your interface is that that input

NOTE Confidence: 0.470306828571429

01:16:54.720 --> 01:16:56.160 visual stimuli into the right.  
NOTE Confidence: 0.470306828571429

01:16:56.160 --> 01:16:57.560 The the pong playing brain  
NOTE Confidence: 0.470306828571429

01:16:57.560 --> 01:16:58.701 computer interface that just  
NOTE Confidence: 0.470306828571429

01:16:58.701 --> 01:17:00.315 was written about last month or  
NOTE Confidence: 0.714554433333333

01:17:00.320 --> 01:17:01.400 cochlear implants that  
NOTE Confidence: 0.714554433333333

01:17:01.400 --> 01:17:02.480 send electrical signals  
NOTE Confidence: 0.835541826086957

01:17:02.480 --> 01:17:04.328 directly to the auditory nerve and and  
NOTE Confidence: 0.835541826086957

01:17:04.328 --> 01:17:06.534 you know you you think and you move a  
NOTE Confidence: 0.835541826086957

01:17:06.534 --> 01:17:08.638 joystick so you can drive your wheelchair,  
NOTE Confidence: 0.835541826086957

01:17:08.640 --> 01:17:09.880 those kinds of things there.  
NOTE Confidence: 0.835541826086957

01:17:09.880 --> 01:17:12.400 No, there's a lot of there's a lot of  
NOTE Confidence: 0.835541826086957

01:17:12.400 --> 01:17:16.120 human brain mechanical interface available.  
NOTE Confidence: 0.1545793

01:17:18.240 --> 01:17:19.476 No, there's sensory input. There's  
NOTE Confidence: 0.1545793

01:17:19.476 --> 01:17:21.090 what I'm saying is there's there's  
NOTE Confidence: 0.7286073025

01:17:21.139 --> 01:17:22.837 actually sensory input available as well.  
NOTE Confidence: 0.842849483666667

01:17:24.920 --> 01:17:26.397 Yeah. And you'd have to explain to

NOTE Confidence: 0.842849483666667  
01:17:26.397 --> 01:17:28.297 me why it would be better to do that  
NOTE Confidence: 0.842849483666667  
01:17:28.297 --> 01:17:30.018 in a model that was disembodied than  
NOTE Confidence: 0.842849483666667  
01:17:30.018 --> 01:17:31.746 you know a volunteer human subject  
NOTE Confidence: 0.842849483666667  
01:17:31.746 --> 01:17:34.840 that that's a fairpoint that that that  
NOTE Confidence: 0.9607624775  
01:17:34.840 --> 01:17:35.880 I agree with. But  
NOTE Confidence: 0.878292965  
01:17:37.040 --> 01:17:38.720 I do think that you know  
NOTE Confidence: 0.84034369  
01:17:39.320 --> 01:17:40.950 there there is potential benefit  
NOTE Confidence: 0.84034369  
01:17:40.950 --> 01:17:42.279 across that event horizon  
NOTE Confidence: 0.84034369  
01:17:42.280 --> 01:17:43.520 of consciousness as well.  
NOTE Confidence: 0.84034369  
01:17:43.520 --> 01:17:45.182 And if we're, you know,  
NOTE Confidence: 0.84034369  
01:17:45.182 --> 01:17:47.237 we're just doing the math  
NOTE Confidence: 0.887203934  
01:17:45.920 --> 01:17:47.240 in our head right now, we say, all right,  
NOTE Confidence: 0.763377028333333  
01:17:47.240 --> 01:17:48.800 that that benefit's not worth it.  
NOTE Confidence: 0.92550351  
01:17:51.200 --> 01:17:52.168 I think that's a reasonable  
NOTE Confidence: 0.92550351  
01:17:52.168 --> 01:17:53.080 conclusion to draw,  
NOTE Confidence: 0.655983535714286

01:17:53.520 --> 01:17:55.676 but that could be, that could be.

NOTE Confidence: 0.957149764

01:17:59.360 --> 01:18:01.920 I've got one question here.

NOTE Confidence: 0.957149764

01:18:01.920 --> 01:18:03.104 This is a follow on from the

NOTE Confidence: 0.957149764

01:18:03.104 --> 01:18:04.500 first question I asked you which

NOTE Confidence: 0.957149764

01:18:04.500 --> 01:18:07.110 was that when you spoke of a a

NOTE Confidence: 0.957149764

01:18:07.110 --> 01:18:09.100 traumatized brain in a living animal,

NOTE Confidence: 0.957149764

01:18:09.100 --> 01:18:11.720 this is a quote or a traumatized,

NOTE Confidence: 0.957149764

01:18:11.720 --> 01:18:14.036 traumatized brain in a living animal

NOTE Confidence: 0.957149764

01:18:14.040 --> 01:18:17.760 is to control a brain or an animal.

NOTE Confidence: 0.957149764

01:18:17.760 --> 01:18:19.822 I'm not quite sure what that question is.

NOTE Confidence: 0.957149764

01:18:19.822 --> 01:18:20.914 I have to apologize to the

NOTE Confidence: 0.957149764

01:18:20.920 --> 01:18:22.064 question of your well,

NOTE Confidence: 0.957149764

01:18:22.064 --> 01:18:23.576 I think when I was talking

NOTE Confidence: 0.957149764

01:18:23.576 --> 01:18:24.278 about traumatized brains,

NOTE Confidence: 0.945776778571429

01:18:24.280 --> 01:18:26.436 I was I was trying to compare

NOTE Confidence: 0.900676216

01:18:31.360 --> 01:18:34.450 suppose we were to bring a pig

NOTE Confidence: 0.900676216

01:18:34.450 --> 01:18:36.880 brain to consciousness in the lab.

NOTE Confidence: 0.894943567857143

01:18:39.320 --> 01:18:42.183 What could what could the negative experience

NOTE Confidence: 0.894943567857143

01:18:42.183 --> 01:18:45.277 of that pig brain possibly amount to?

NOTE Confidence: 0.894943567857143

01:18:45.280 --> 01:18:47.800 And I was making a point that's sort of

NOTE Confidence: 0.894943567857143

01:18:47.800 --> 01:18:50.017 parallel to the point that you made about

NOTE Confidence: 0.894943567857143

01:18:50.017 --> 01:18:52.788 the fact that we all eat pork in other

NOTE Confidence: 0.894943567857143

01:18:52.788 --> 01:18:55.808 parts of our medical research complex.

NOTE Confidence: 0.894943567857143

01:18:55.808 --> 01:19:00.250 We bash pigs in the head in order to make

NOTE Confidence: 0.894943567857143

01:19:00.250 --> 01:19:03.120 judgments about the effects of brain trauma.

NOTE Confidence: 0.894943567857143

01:19:03.120 --> 01:19:05.528 And I can't imagine that the ill

NOTE Confidence: 0.894943567857143

01:19:05.528 --> 01:19:08.204 effects of a pig of having its brain

NOTE Confidence: 0.894943567857143

01:19:08.204 --> 01:19:11.000 come to life in a VAT in the lab,

NOTE Confidence: 0.894943567857143

01:19:11.000 --> 01:19:13.552 could be worse than the ill effects on

NOTE Confidence: 0.894943567857143

01:19:13.552 --> 01:19:16.165 the pig who has his head bashed in as

NOTE Confidence: 0.894943567857143

01:19:16.165 --> 01:19:18.378 part of a brain trauma experiment and

NOTE Confidence: 0.894943567857143

01:19:18.378 --> 01:19:21.270 or a pig who is part of a cancer study  
NOTE Confidence: 0.894943567857143

01:19:21.270 --> 01:19:23.439 where death is the end point and so on.  
NOTE Confidence: 0.894943567857143

01:19:23.440 --> 01:19:27.080 Right. We do lots of things to pigs  
NOTE Confidence: 0.894943567857143

01:19:27.080 --> 01:19:29.502 that strike me as worse than what  
NOTE Confidence: 0.894943567857143

01:19:29.502 --> 01:19:32.320 we would be doing to the pig brain  
NOTE Confidence: 0.894943567857143

01:19:32.320 --> 01:19:34.280 in our research studies. So  
NOTE Confidence: 0.907611175

01:19:34.280 --> 01:19:35.720 but let me ask you this, but  
NOTE Confidence: 0.858596119285714

01:19:36.720 --> 01:19:38.360 that's not enough to say that we could  
NOTE Confidence: 0.858596119285714

01:19:38.360 --> 01:19:39.992 go ahead and do our research studies  
NOTE Confidence: 0.858596119285714

01:19:39.992 --> 01:19:41.753 because it might be really wrong that  
NOTE Confidence: 0.858596119285714

01:19:41.753 --> 01:19:43.355 we're doing all those terrible things.  
NOTE Confidence: 0.858596119285714

01:19:43.360 --> 01:19:45.360 But let me ask this question I I get that.  
NOTE Confidence: 0.767502639333333

01:19:45.720 --> 01:19:47.943 But but to me it's a cannonball and a  
NOTE Confidence: 0.767502639333333

01:19:47.943 --> 01:19:49.892 BB to some extent to say we're really  
NOTE Confidence: 0.767502639333333

01:19:49.892 --> 01:19:51.600 going to worry about this BB because but  
NOTE Confidence: 0.767502639333333

01:19:51.600 --> 01:19:53.160 we're going to ignore the cannonball.

NOTE Confidence: 0.767502639333333

01:19:53.160 --> 01:19:55.440 But the other aspect of this is that

NOTE Confidence: 0.767502639333333

01:19:55.440 --> 01:19:57.852 there's a lot of concern about the pigs,

NOTE Confidence: 0.767502639333333

01:19:57.852 --> 01:20:00.480 because pigs, as you point out,

NOTE Confidence: 0.767502639333333

01:20:00.480 --> 01:20:01.278 are very intelligent,

NOTE Confidence: 0.767502639333333

01:20:01.278 --> 01:20:02.405 very social animals, etcetera.

NOTE Confidence: 0.767502639333333

01:20:02.405 --> 01:20:04.680 And from an ethicist point of view.

NOTE Confidence: 0.767502639333333

01:20:04.680 --> 01:20:06.520 And again, I know you don't call

NOTE Confidence: 0.767502639333333

01:20:06.520 --> 01:20:07.267 yourself an animal ethicist,

NOTE Confidence: 0.767502639333333

01:20:07.267 --> 01:20:08.112 but this is a question

NOTE Confidence: 0.767502639333333

01:20:08.112 --> 01:20:09.079 we can all ask ourselves

NOTE Confidence: 0.943831685714286

01:20:09.440 --> 01:20:12.426 is does that make this work more or less

NOTE Confidence: 0.943831685714286

01:20:12.426 --> 01:20:14.680 permissible than if this were the brain

NOTE Confidence: 0.6563555675

01:20:14.680 --> 01:20:18.208 of a a mouse, or the brain of

NOTE Confidence: 0.6563555675

01:20:18.208 --> 01:20:21.136 something much smaller and and and

NOTE Confidence: 0.6563555675

01:20:21.136 --> 01:20:22.960 less intelligent, less social?

NOTE Confidence: 0.819180408333333

01:20:23.520 --> 01:20:25.116 Yeah, I mean this is controversial,  
NOTE Confidence: 0.819180408333333

01:20:25.120 --> 01:20:27.288 controversial view in philosophy.  
NOTE Confidence: 0.819180408333333

01:20:27.288 --> 01:20:31.861 But I accept what is widely accepted in the  
NOTE Confidence: 0.819180408333333

01:20:31.861 --> 01:20:34.240 kind of in some parts of animal ethics,  
NOTE Confidence: 0.819180408333333

01:20:34.240 --> 01:20:38.476 including Shelley Kagan here at Yale  
NOTE Confidence: 0.819180408333333

01:20:38.480 --> 01:20:41.693 and in in a lot of the debate about  
NOTE Confidence: 0.819180408333333

01:20:41.693 --> 01:20:45.359 the use of animals in medical research,  
NOTE Confidence: 0.819180408333333

01:20:45.360 --> 01:20:49.056 The the refine and reduce and replace  
NOTE Confidence: 0.819180408333333

01:20:49.056 --> 01:20:52.550 kind of mantra that iacooks obey when  
NOTE Confidence: 0.819180408333333

01:20:52.550 --> 01:20:54.488 their institutional animal care and  
NOTE Confidence: 0.819180408333333

01:20:54.488 --> 01:20:56.660 use committees obey when they're trying  
NOTE Confidence: 0.819180408333333

01:20:56.715 --> 01:20:58.437 to figure out what kinds of animals  
NOTE Confidence: 0.819180408333333

01:20:58.437 --> 01:21:00.600 you can use for what kind of research.  
NOTE Confidence: 0.819180408333333

01:21:00.600 --> 01:21:03.841 They will always say that it's preferable  
NOTE Confidence: 0.819180408333333

01:21:03.841 --> 01:21:06.918 to climb down the species ladder.  
NOTE Confidence: 0.819180408333333

01:21:06.920 --> 01:21:08.864 If you can get the result in your



NOTE Confidence: 0.819180408333333

01:21:08.864 --> 01:21:10.079 study from a zebrafish,

NOTE Confidence: 0.819180408333333

01:21:10.080 --> 01:21:11.316 don't get it from a mouse.

NOTE Confidence: 0.819180408333333

01:21:11.320 --> 01:21:13.040 If you can get it from a mouse,

NOTE Confidence: 0.819180408333333

01:21:13.040 --> 01:21:15.840 don't get it from a marmoset, right.

NOTE Confidence: 0.819180408333333

01:21:15.840 --> 01:21:16.240 I get

NOTE Confidence: 0.762875499166667

01:21:16.240 --> 01:21:17.520 it if they say that what I'm asking

NOTE Confidence: 0.762875499166667

01:21:17.520 --> 01:21:21.000 is the ethical justification for it.

NOTE Confidence: 0.950620827857143

01:21:21.000 --> 01:21:23.205 Because the thought is that

NOTE Confidence: 0.950620827857143

01:21:23.205 --> 01:21:25.410 the amount of suffering you're

NOTE Confidence: 0.950620827857143

01:21:25.487 --> 01:21:27.740 inducing in the animal inversely

NOTE Confidence: 0.950620827857143

01:21:27.740 --> 01:21:30.640 varies with their mental capacity.

NOTE Confidence: 0.9612494

01:21:32.720 --> 01:21:34.670 Humans exposed to a certain

NOTE Confidence: 0.9612494

01:21:34.670 --> 01:21:35.840 kind of experimental

NOTE Confidence: 0.950300863

01:21:38.600 --> 01:21:41.740 intervention might have enhanced capacity

NOTE Confidence: 0.950300863

01:21:41.740 --> 01:21:44.880 to suffer during that intervention.

NOTE Confidence: 0.950300863

01:21:44.880 --> 01:21:46.520 Even Peter Singer, right Mr.  
NOTE Confidence: 0.950300863

01:21:46.520 --> 01:21:48.260 Animal Rights Guy says.  
NOTE Confidence: 0.950300863

01:21:48.260 --> 01:21:52.072 Like one of the one of the primary  
NOTE Confidence: 0.950300863

01:21:52.072 --> 01:21:54.880 inventors of modern era animal  
NOTE Confidence: 0.950300863

01:21:54.880 --> 01:21:57.280 rights rhetoric and philosophy.  
NOTE Confidence: 0.950300863

01:21:57.280 --> 01:22:01.698 He says if there are 590 LB animals  
NOTE Confidence: 0.950300863

01:22:01.698 --> 01:22:04.215 in a boat, four of them are people  
NOTE Confidence: 0.950300863

01:22:04.215 --> 01:22:06.319 and one of them is a large dog,  
NOTE Confidence: 0.950300863

01:22:06.320 --> 01:22:08.360 and only four can survive with  
NOTE Confidence: 0.950300863

01:22:08.360 --> 01:22:10.120 the provisions in the boat.  
NOTE Confidence: 0.950300863

01:22:10.120 --> 01:22:13.240 He says you should throw the dog overboard,  
NOTE Confidence: 0.950300863

01:22:13.240 --> 01:22:14.925 not one of the people. Why?  
NOTE Confidence: 0.950300863

01:22:14.925 --> 01:22:17.355 Because he's being a good utilitarian.  
NOTE Confidence: 0.950300863

01:22:17.360 --> 01:22:19.556 He thinks the dog, like us,  
NOTE Confidence: 0.950300863

01:22:19.560 --> 01:22:20.784 will roam around in the water  
NOTE Confidence: 0.950300863

01:22:20.784 --> 01:22:22.275 for a long time in the cold

NOTE Confidence: 0.950300863

01:22:22.275 --> 01:22:23.517 water until it gets too cold,

NOTE Confidence: 0.950300863

01:22:23.520 --> 01:22:25.400 and then it's going to drown and die.

NOTE Confidence: 0.950300863

01:22:25.400 --> 01:22:27.840 But the dog is going.

NOTE Confidence: 0.950300863

01:22:27.840 --> 01:22:29.770 I'm getting tired and having

NOTE Confidence: 0.950300863

01:22:29.770 --> 01:22:31.314 various physical bodily sensations,

NOTE Confidence: 0.950300863

01:22:31.320 --> 01:22:33.525 but he's not thinking I'm going to

NOTE Confidence: 0.950300863

01:22:33.525 --> 01:22:34.810 miss my granddaughter's birthday.

NOTE Confidence: 0.950300863

01:22:34.810 --> 01:22:37.085 Oh, how will my wife find out

NOTE Confidence: 0.950300863

01:22:37.085 --> 01:22:38.651 what happened to me? Right.

NOTE Confidence: 0.950300863

01:22:38.651 --> 01:22:40.877 We are capable of much more

NOTE Confidence: 0.950300863

01:22:40.877 --> 01:22:42.477 sophisticated levels of suffering

NOTE Confidence: 0.950300863

01:22:42.477 --> 01:22:44.557 in that kind of circumstance.

NOTE Confidence: 0.950300863

01:22:44.560 --> 01:22:46.640 So toss the dog, OK?

NOTE Confidence: 0.950300863

01:22:46.640 --> 01:22:48.838 That's what the Peter Singer example is.

NOTE Confidence: 0.950300863

01:22:48.840 --> 01:22:49.101 Well,

NOTE Confidence: 0.950300863

01:22:49.101 --> 01:22:50.406 something like that is going  
NOTE Confidence: 0.950300863

01:22:50.406 --> 01:22:52.195 on when you say it's worse to  
NOTE Confidence: 0.950300863

01:22:52.195 --> 01:22:53.805 experiment on a pig than it is  
NOTE Confidence: 0.950300863

01:22:53.857 --> 01:22:55.315 to experiment on on a mouse.  
NOTE Confidence: 0.950300863

01:22:55.320 --> 01:22:58.085 We just sort of feel that pigs  
NOTE Confidence: 0.950300863

01:22:58.085 --> 01:23:00.928 have more sophisticated capacity  
NOTE Confidence: 0.950300863

01:23:00.928 --> 01:23:03.793 for suffering than mice have.  
NOTE Confidence: 0.950300863

01:23:03.793 --> 01:23:05.437 You're leaving that assumption  
NOTE Confidence: 0.350370033333333

01:23:09.120 --> 01:23:12.598 of what it's it's a different. It's not it,  
NOTE Confidence: 0.350370033333333

01:23:12.600 --> 01:23:14.360 it's a different guy. Yeah. Well, but  
NOTE Confidence: 0.887355675294118

01:23:17.360 --> 01:23:19.892 yeah, on evidence of the mental  
NOTE Confidence: 0.887355675294118

01:23:19.892 --> 01:23:22.564 capacities of different kinds of animals  
NOTE Confidence: 0.887355675294118

01:23:22.564 --> 01:23:24.839 as demonstrated in their behaviors,  
NOTE Confidence: 0.887355675294118

01:23:24.840 --> 01:23:27.680 their degree of sociality.  
NOTE Confidence: 0.887355675294118

01:23:27.680 --> 01:23:29.198 Oysters, for example.  
NOTE Confidence: 0.5909608

01:23:32.440 --> 01:23:32.880 Yeah.

NOTE Confidence: 0.7792264025

01:23:34.680 --> 01:23:35.520 So hang on. It's.

NOTE Confidence: 0.680548905

01:23:35.800 --> 01:23:38.100 Well that. Yeah, that go

NOTE Confidence: 0.680548905

01:23:38.100 --> 01:23:41.320 ahead. If brain, brain,

NOTE Confidence: 0.51584653

01:23:41.320 --> 01:23:42.220 the microphone is going to

NOTE Confidence: 0.51584653

01:23:42.220 --> 01:23:43.120 be among many other things.

NOTE Confidence: 0.51584653

01:23:43.120 --> 01:23:44.440 But at this point the last let me

NOTE Confidence: 0.51584653

01:23:44.440 --> 01:23:45.638 just say so this this will be.

NOTE Confidence: 0.51584653

01:23:45.640 --> 01:23:47.727 So the question was about you've

NOTE Confidence: 0.51584653

01:23:47.727 --> 01:23:48.729 made a comment and then this

NOTE Confidence: 0.51584653

01:23:48.729 --> 01:23:50.080 will this will be the last one.

NOTE Confidence: 0.51584653

01:23:50.080 --> 01:23:51.840 So let me just be it has to do with

NOTE Confidence: 0.51584653

01:23:51.840 --> 01:23:53.590 comparing the suffering of different

NOTE Confidence: 0.51584653

01:23:53.590 --> 01:23:56.270 species as and and and what is there

NOTE Confidence: 0.51584653

01:23:56.345 --> 01:23:59.140 evidence for that and you were about

NOTE Confidence: 0.51584653

01:23:59.140 --> 01:24:01.120 to discuss the evidence for that.

NOTE Confidence: 0.952545735833333

01:24:02.040 --> 01:24:03.312 As far as I understand it  
NOTE Confidence: 0.952545735833333

01:24:03.312 --> 01:24:04.680 and this is not my field.  
NOTE Confidence: 0.952545735833333

01:24:04.680 --> 01:24:07.650 I'm quoting people who are more  
NOTE Confidence: 0.952545735833333

01:24:07.650 --> 01:24:09.960 expert in animal ethics than I am.  
NOTE Confidence: 0.952545735833333

01:24:09.960 --> 01:24:12.400 But it has to do with brain size,  
NOTE Confidence: 0.952545735833333

01:24:12.400 --> 01:24:14.400 brain capacity, evidence of sociality,  
NOTE Confidence: 0.952545735833333

01:24:14.400 --> 01:24:17.040 evidence of the degree of memory  
NOTE Confidence: 0.952545735833333

01:24:17.040 --> 01:24:19.342 the different animals possess when  
NOTE Confidence: 0.952545735833333

01:24:19.342 --> 01:24:21.797 they're tested in different ways.  
NOTE Confidence: 0.952545735833333

01:24:21.800 --> 01:24:23.872 There are, there are lots of people  
NOTE Confidence: 0.952545735833333

01:24:23.872 --> 01:24:26.407 who spend a lot of time worrying  
NOTE Confidence: 0.952545735833333

01:24:26.407 --> 01:24:27.991 about the comparative mental  
NOTE Confidence: 0.952545735833333

01:24:27.991 --> 01:24:30.240 capacities of different animals now.  
NOTE Confidence: 0.952545735833333

01:24:30.240 --> 01:24:32.006 A capacity to sell, Sure.  
NOTE Confidence: 0.952545735833333

01:24:32.006 --> 01:24:33.636 And, and I will say,  
NOTE Confidence: 0.952545735833333

01:24:33.640 --> 01:24:36.874 it's been a huge trend in recent

NOTE Confidence: 0.952545735833333

01:24:36.874 --> 01:24:39.678 years for for people to come out with

NOTE Confidence: 0.952545735833333

01:24:39.680 --> 01:24:42.524 lots of surprising evidence about how

NOTE Confidence: 0.952545735833333

01:24:42.524 --> 01:24:45.040 extraordinary the capacities of animals,

NOTE Confidence: 0.952545735833333

01:24:45.040 --> 01:24:46.480 how extraordinarily greater than

NOTE Confidence: 0.952545735833333

01:24:46.480 --> 01:24:48.640 we used to think the capacity

NOTE Confidence: 0.952545735833333

01:24:48.703 --> 01:24:50.039 of certain animals are.

NOTE Confidence: 0.952545735833333

01:24:50.040 --> 01:24:51.644 Like birds, for example,

NOTE Confidence: 0.952545735833333

01:24:51.644 --> 01:24:54.050 can remember the faces of people

NOTE Confidence: 0.952545735833333

01:24:54.121 --> 01:24:55.876 who've been mean to them,

NOTE Confidence: 0.952545735833333

01:24:55.880 --> 01:24:59.560 and fish can learn to avoid painful stimuli,

NOTE Confidence: 0.952545735833333

01:24:59.560 --> 01:25:01.498 and they can learn from experience

NOTE Confidence: 0.952545735833333

01:25:01.498 --> 01:25:03.183 and change their swimming patterns

NOTE Confidence: 0.952545735833333

01:25:03.183 --> 01:25:04.519 in response to things.

NOTE Confidence: 0.952545735833333

01:25:04.520 --> 01:25:07.904 So there's been a huge theme in recent

NOTE Confidence: 0.952545735833333

01:25:07.904 --> 01:25:10.301 animal ethics literature about how

NOTE Confidence: 0.952545735833333

01:25:10.301 --> 01:25:12.540 much more mental capacity different  
NOTE Confidence: 0.952545735833333

01:25:12.540 --> 01:25:15.480 kinds of animals have than we have  
NOTE Confidence: 0.952545735833333

01:25:15.550 --> 01:25:17.720 commonly given them credit for.  
NOTE Confidence: 0.952545735833333

01:25:17.720 --> 01:25:20.807 But that is not at all the same thing  
NOTE Confidence: 0.952545735833333

01:25:20.807 --> 01:25:22.900 as to say their mental capacities  
NOTE Confidence: 0.952545735833333

01:25:22.900 --> 01:25:25.180 are so identical that they all  
NOTE Confidence: 0.952545735833333

01:25:25.180 --> 01:25:27.093 deserve the same level of moral  
NOTE Confidence: 0.952545735833333

01:25:27.093 --> 01:25:29.239 regard or the same level of rights.  
NOTE Confidence: 0.952545735833333

01:25:29.240 --> 01:25:31.158 There are people like Tom Regan who  
NOTE Confidence: 0.952545735833333

01:25:31.158 --> 01:25:33.066 think that any animal that is the  
NOTE Confidence: 0.952545735833333

01:25:33.066 --> 01:25:35.208 subject of a life that leads a life  
NOTE Confidence: 0.952545735833333

01:25:35.208 --> 01:25:36.816 and makes choices about what it's  
NOTE Confidence: 0.952545735833333

01:25:36.816 --> 01:25:39.600 going to do next has an absolute  
NOTE Confidence: 0.952545735833333

01:25:39.600 --> 01:25:42.918 right not to be interfered with by us.  
NOTE Confidence: 0.952545735833333

01:25:42.920 --> 01:25:45.180 But most animal ethicists acknowledge  
NOTE Confidence: 0.952545735833333

01:25:45.180 --> 01:25:48.047 some kinds of degrees of priority



NOTE Confidence: 0.952545735833333  
01:25:48.047 --> 01:25:50.717 between different kinds of animals,  
NOTE Confidence: 0.952545735833333  
01:25:50.720 --> 01:25:51.840 and we spend a lot of time  
NOTE Confidence: 0.923659944285714  
01:25:52.520 --> 01:25:54.300 agonizing and discussing the  
NOTE Confidence: 0.923659944285714  
01:25:54.300 --> 01:25:56.531 different degrees of of moral status  
NOTE Confidence: 0.923659944285714  
01:25:56.531 --> 01:25:58.313 and priority among our own species.  
NOTE Confidence: 0.8562208  
01:25:58.720 --> 01:25:59.920 People with dementia,  
NOTE Confidence: 0.71825305  
01:26:02.120 --> 01:26:04.880 newborns, fetuses, right.  
NOTE Confidence: 0.83749955  
01:26:05.840 --> 01:26:07.480 This is absolutely fascinating stuff.  
NOTE Confidence: 0.83749955  
01:26:07.480 --> 01:26:08.376 Steven, we're going to follow  
NOTE Confidence: 0.83749955  
01:26:08.376 --> 01:26:10.440 this work with interest and we I,  
NOTE Confidence: 0.83749955  
01:26:10.440 --> 01:26:11.946 I really appreciate your coming and  
NOTE Confidence: 0.83749955  
01:26:11.946 --> 01:26:13.278 sharing this with us and working  
NOTE Confidence: 0.83749955  
01:26:13.278 --> 01:26:14.837 this through this has been terrific.  
NOTE Confidence: 0.83749955  
01:26:14.840 --> 01:26:15.400 Thank you so much.  
NOTE Confidence: 0.790849201428571  
01:26:15.400 --> 01:26:16.478 Thank you so much for having me.  
NOTE Confidence: 0.790849201428571

01:26:16.480 --> 01:26:17.960 And thank you for all the great questions.

NOTE Confidence: 0.826073848571429

01:26:22.200 --> 01:26:23.999 All right. We'll see you next week.