WEBVTT

NOTE duration:"00:18:13.3400000"

NOTE recognizability:0.932

NOTE language:en-us

NOTE Confidence: 0.913065593333333

00:00:00.000 --> 00:00:04.758 Next is Doctor in Huon Park,

NOTE Confidence: 0.913065593333333

00:00:04.760 --> 00:00:08.176 who received his PhD at the University

NOTE Confidence: 0.913065593333333

00:00:08.176 --> 00:00:11.084 of Illinois Ivana studying and signaling,

NOTE Confidence: 0.913065593333333

00:00:11.084 --> 00:00:13.489 and then became a postdoctoral

NOTE Confidence: 0.913065593333333

00:00:13.489 --> 00:00:15.918 fellow at Harvard Medical School.

NOTE Confidence: 0.913065593333333

00:00:15.920 --> 00:00:18.840 Working in reprogramming from 2009.

NOTE Confidence: 0.913065593333333

00:00:18.840 --> 00:00:21.080 He conducts stem cell and brain organic

NOTE Confidence: 0.913065593333333

00:00:21.080 --> 00:00:23.798 research at the stem cell center in genetics,

NOTE Confidence: 0.913065593333333

00:00:23.800 --> 00:00:26.496 and his main goal is to construct and

NOTE Confidence: 0.913065593333333

00:00:26.496 --> 00:00:28.399 investigate human brain and diseases.

NOTE Confidence: 0.936228174

00:00:32.960 --> 00:00:34.744 First of all I want to do thanks

NOTE Confidence: 0.936228174

00:00:34.744 --> 00:00:36.152 to organizer and and also I

NOTE Confidence: 0.936228174

00:00:36.152 --> 00:00:37.520 want to give thanks to Florida.

NOTE Confidence: 0.936228174

00:00:37.520 --> 00:00:39.767 Actually Florida is one of the first

NOTE Confidence: 0.936228174

00:00:39.767 --> 00:00:41.814 person actually the pioneer of this

NOTE Confidence: 0.936228174

00:00:41.814 --> 00:00:43.848 brain overnight field at Yale actually

NOTE Confidence: 0.936228174

00:00:43.848 --> 00:00:45.681 they I really appreciate a walk

NOTE Confidence: 0.936228174

00:00:45.681 --> 00:00:47.870 before and also I found I found as

NOTE Confidence: 0.936228174

00:00:47.870 --> 00:00:49.620 a director for the stamps at center

NOTE Confidence: 0.936228174

00:00:49.675 --> 00:00:51.460 he always encouraged us to walk on

NOTE Confidence: 0.936228174

00:00:51.460 --> 00:00:53.478 a little bit more challenging work.

NOTE Confidence: 0.936228174

00:00:53.480 --> 00:00:56.549 So the because of the high found we actually

NOTE Confidence: 0.936228174

00:00:56.549 --> 00:00:59.288 start working on this 3D brain overnoid.

NOTE Confidence: 0.936228174

00:00:59.290 --> 00:01:01.186 So today I'm going to actually

NOTE Confidence: 0.936228174

00:01:01.186 --> 00:01:03.783 share the couple of a new kind of

NOTE Confidence: 0.936228174

00:01:03.783 --> 00:01:05.363 unpublished work so related with

NOTE Confidence: 0.936228174

00:01:05.363 --> 00:01:07.328 the diaspolic brain organoid.

NOTE Confidence: 0.954090775

00:01:09.650 --> 00:01:11.650 So basically we are studying

NOTE Confidence: 0.954090775

00:01:11.650 --> 00:01:12.850 human brain ourselves.

NOTE Confidence: 0.954090775

00:01:12.850 --> 00:01:15.923 So we are very interested in human

NOTE Confidence: 0.954090775

00:01:15.923 --> 00:01:17.782 brain development and disease

NOTE Confidence: 0.954090775

00:01:17.782 --> 00:01:20.554 and especially we are using human

NOTE Confidence: 0.954090775

00:01:20.554 --> 00:01:23.279 brain organoid as a mother system.

NOTE Confidence: 0.954090775

00:01:23.280 --> 00:01:25.114 So if you look at this structure,

NOTE Confidence: 0.954090775

00:01:25.120 --> 00:01:26.933 it's called like a brain organoid and

NOTE Confidence: 0.954090775

00:01:26.933 --> 00:01:28.640 some people say cortical organoid,

NOTE Confidence: 0.954090775

00:01:28.640 --> 00:01:29.496 cerebral organoid.

NOTE Confidence: 0.954090775

00:01:29.496 --> 00:01:31.636 So you can imagine whatever,

NOTE Confidence: 0.954090775

00:01:31.640 --> 00:01:33.320 like you can imagine like oh,

NOTE Confidence: 0.954090775

00:01:33.320 --> 00:01:37.264 how our brain function and can we mimic

NOTE Confidence: 0.954090775

00:01:37.264 --> 00:01:39.524 this kind of our brain function within

NOTE Confidence: 0.954090775

00:01:39.524 --> 00:01:41.520 this brain organoid like a higher order,

NOTE Confidence: 0.954090775

00:01:41.520 --> 00:01:43.632 like a cognitive function as well

NOTE Confidence: 0.954090775

00:01:43.632 --> 00:01:46.099 as maybe like something that related

NOTE Confidence: 0.954090775

00:01:46.099 --> 00:01:48.079 with disease and neurodegeneration.

NOTE Confidence: 0.954090775

00:01:48.080 --> 00:01:48.425 OK.

NOTE Confidence: 0.954090775

00:01:48.425 --> 00:01:50.840 So there are a lot of opportunity

NOTE Confidence: 0.954090775

00:01:50.840 --> 00:01:53.120 using this human brain organoid.

NOTE Confidence: 0.954090775

00:01:53.120 --> 00:01:55.850 For the basic neural development biotic

NOTE Confidence: 0.954090775

00:01:55.850 --> 00:01:59.220 question as well as disease and Human

NOTE Confidence: 0.954090775

00:01:59.220 --> 00:02:01.675 Genetics for the brain disorders.

NOTE Confidence: 0.954090775

00:02:01.680 --> 00:02:04.530 OK, so about setting aside all

NOTE Confidence: 0.954090775

00:02:04.530 --> 00:02:05.480 those question,

NOTE Confidence: 0.954090775

00:02:05.480 --> 00:02:07.685 I think maybe first we want to

NOTE Confidence: 0.954090775

00:02:07.685 --> 00:02:09.639 really generate the brain organoid,

NOTE Confidence: 0.954090775

00:02:09.640 --> 00:02:12.420 some really structurally functionally

NOTE Confidence: 0.954090775

00:02:12.420 --> 00:02:15.895 reproduce as a human brain.

NOTE Confidence: 0.954090775

00:02:15.900 --> 00:02:17.700 So basically two years ago actually

NOTE Confidence: 0.954090775

00:02:17.700 --> 00:02:19.620 as I said following the Florida,

NOTE Confidence: 0.954090775

00:02:19.620 --> 00:02:23.015 the pioneering work like almost like 7-8,

NOTE Confidence: 0.954090775

00:02:23.020 --> 00:02:25.468 nine years ago we were we were studying

NOTE Confidence: 0.954090775

00:02:25.468 --> 00:02:28.218 like a brain disorder using stem cell,

NOTE Confidence: 0.954090775

00:02:28.220 --> 00:02:30.257 but we are most focusing on 2D.

NOTE Confidence: 0.954090775

00:02:30.260 --> 00:02:32.192 But we thought that maybe it's a

NOTE Confidence: 0.954090775

00:02:32.192 --> 00:02:34.310 good time for us to really develop

NOTE Confidence: 0.954090775

00:02:34.310 --> 00:02:36.561 this tool like a 3D especially we

NOTE Confidence: 0.954090775

00:02:36.561 --> 00:02:38.649 were interested in more like a

NOTE Confidence: 0.954090775

00:02:38.649 --> 00:02:42.940 regionally defined brain organoid so.

NOTE Confidence: 0.954090775

00:02:42.940 --> 00:02:44.620 During embryogenesis or during

NOTE Confidence: 0.954090775

00:02:44.620 --> 00:02:45.460 the mutilation,

NOTE Confidence: 0.954090775

00:02:45.460 --> 00:02:48.505 there are five of primary vascular in

NOTE Confidence: 0.954090775

00:02:48.505 --> 00:02:51.164 the brain, neural tube talence Apollon,

NOTE Confidence: 0.954090775

00:02:51.164 --> 00:02:52.056 Dience Apollon,

NOTE Confidence: 0.954090775

00:02:52.060 --> 00:02:55.660 Visions Apollon and Visions Apollon.

NOTE Confidence: 0.954090775

00:02:55.660 --> 00:02:58.820 And from this primary vascular the

NOTE Confidence: 0.954090775

00:02:58.820 --> 00:03:01.220 older brain structure in adults

NOTE Confidence: 0.954090775

00:03:01.220 --> 00:03:02.180 actually form.

NOTE Confidence: 0.954090775

00:03:02.180 --> 00:03:05.600 Especially in the Talence Apollon

NOTE Confidence: 0.954090775

00:03:05.600 --> 00:03:09.989 we have this cortex and Dyne C.

NOTE Confidence: 0.954090775

00:03:09.989 --> 00:03:12.572 So a few years ago we developed

NOTE Confidence: 0.954090775

00:03:12.572 --> 00:03:15.600 a couple of method to produce the

NOTE Confidence: 0.954090775

00:03:15.600 --> 00:03:16.560 cortical organoid.

NOTE Confidence: 0.954090775

00:03:16.560 --> 00:03:19.440 Especially we made a dorsal cortical

NOTE Confidence: 0.954090775

00:03:19.440 --> 00:03:19.920 organoid.

NOTE Confidence: 0.954090775

00:03:19.920 --> 00:03:22.272 At the time we named them as a

NOTE Confidence: 0.954090775

00:03:22.272 --> 00:03:23.520 human cortical organoid.

NOTE Confidence: 0.954090775

00:03:23.520 --> 00:03:26.152 And again we also generate the method

NOTE Confidence: 0.954090775

00:03:26.152 --> 00:03:28.560 to produce ventral cortical organoid.

NOTE Confidence: 0.954090775

00:03:28.560 --> 00:03:30.666 We named them as a video

NOTE Confidence: 0.954090775

00:03:30.666 --> 00:03:31.719 ganglion gaminous organoid.

NOTE Confidence: 0.954090775

00:03:31.720 --> 00:03:33.400 So there was a structure.

NOTE Confidence: 0.954090775

00:03:33.400 --> 00:03:33.659 Actually,

NOTE Confidence: 0.954090775

00:03:33.659 --> 00:03:35.472 if you look at all the sections

NOTE Confidence: 0.954090775

00:03:35.472 --> 00:03:37.077 in the immunostaining and really

NOTE Confidence: 0.954090775

00:03:37.077 --> 00:03:38.782 show like cortical layers and

NOTE Confidence: 0.954090775

00:03:38.782 --> 00:03:40.439 when we measure activity,

NOTE Confidence: 0.954090775

00:03:40.440 --> 00:03:42.078 we can see the neural activity.

NOTE Confidence: 0.950317

00:03:48.400 --> 00:03:50.488 So with the success of this

NOTE Confidence: 0.950317

00:03:50.488 --> 00:03:51.880 generating the cortical organoid,

NOTE Confidence: 0.950317

00:03:51.880 --> 00:03:54.552 we thought that maybe we try to generate

NOTE Confidence: 0.950317

00:03:54.552 --> 00:03:57.022 the another region of the the full

NOTE Confidence: 0.950317

00:03:57.022 --> 00:03:59.226 grain like a subcortical region called

NOTE Confidence: 0.950317

00:03:59.226 --> 00:04:01.650 the catalamus and we were successful.

NOTE Confidence: 0.950317

00:04:01.650 --> 00:04:05.010 And we named them as human thalamic organoid.

NOTE Confidence: 0.950317

00:04:05.010 --> 00:04:07.551 So with the success of this generation

NOTE Confidence: 0.950317

00:04:07.551 --> 00:04:09.610 of regionally defined brain organoid,

NOTE Confidence: 0.950317

00:04:09.610 --> 00:04:11.830 we questioned ourselves because of these

NOTE Confidence: 0.950317

00:04:11.830 --> 00:04:14.528 are the like a really small structure

NOTE Confidence: 0.950317

00:04:14.528 --> 00:04:17.209 like a 1 to 2 millimeter structure

NOTE Confidence: 0.950317

00:04:17.282 --> 00:04:19.570 and it's a tiny and but our brain,

NOTE Confidence: 0.950317

00:04:19.570 --> 00:04:21.786 we are brain is huge and also we

NOTE Confidence: 0.950317

00:04:21.786 --> 00:04:24.980 have a really like a the like a

NOTE Confidence: 0.950317

00:04:24.980 --> 00:04:26.688 regionally defined brain structure.

NOTE Confidence: 0.950317

00:04:26.690 --> 00:04:28.760 And we will question whether we

NOTE Confidence: 0.950317

00:04:28.760 --> 00:04:31.028 could develop method to produce more

NOTE Confidence: 0.950317

00:04:31.028 --> 00:04:33.475 regionally defined brain or anoid and

NOTE Confidence: 0.950317

00:04:33.475 --> 00:04:36.170 either in the cortex and the dilemmas.

NOTE Confidence: 0.950317

00:04:36.170 --> 00:04:39.394 And today I'm going to only introduce our

NOTE Confidence: 0.950317

00:04:39.394 --> 00:04:42.700 study on the Dilemic region and the like

NOTE Confidence: 0.950317

00:04:42.700 --> 00:04:46.410 a so-called like a diencephalic development.

NOTE Confidence: 0.950317

00:04:46.410 --> 00:04:47.774 So that's the question.

NOTE Confidence: 0.950317

00:04:47.774 --> 00:04:49.820 So let me quickly introduce the

NOTE Confidence: 0.950317

00:04:49.887 --> 00:04:52.367 development process of the diencephalon.

NOTE Confidence: 0.950317

00:04:52.370 --> 00:04:55.324 So Diane Cephalon developed as a unique

NOTE Confidence: 0.950317

00:04:55.324 --> 00:04:57.079 structure called like a prosomer.

NOTE Confidence: 0.950317

00:04:57.079 --> 00:05:00.220 So it has a P1 this is P2 area

NOTE Confidence: 0.950317

00:05:00.310 --> 00:05:03.310 and P3 and P1 developed as a pre

NOTE Confidence: 0.950317

00:05:03.310 --> 00:05:05.807 tecton and P3 developed as A3.

NOTE Confidence: 0.950317

00:05:05.810 --> 00:05:09.065 Thalamus and P2 are the major region

NOTE Confidence: 0.950317

00:05:09.065 --> 00:05:11.610 that which developed as a thalamus

NOTE Confidence: 0.950317

00:05:11.610 --> 00:05:14.370 and the dorsal of ventral thalamus,

NOTE Confidence: 0.950317

00:05:14.370 --> 00:05:16.682 thalamy region called hyvenula

NOTE Confidence: 0.950317

00:05:16.682 --> 00:05:18.416 and peer gland.

NOTE Confidence: 0.950317

00:05:18.420 --> 00:05:20.412 So development biology actually

NOTE Confidence: 0.950317

00:05:20.412 --> 00:05:22.902 defined like a development principle

NOTE Confidence: 0.950317

00:05:22.902 --> 00:05:25.358 that regulate the development of

NOTE Confidence: 0.950317

00:05:25.358 --> 00:05:27.713 this palamic region like especially

NOTE Confidence: 0.950317

00:05:27.713 --> 00:05:30.400 there are three major growth factors

NOTE Confidence: 0.950317

00:05:30.400 --> 00:05:32.766 that regulate the develop developing

NOTE Confidence: 0.950317

00:05:32.766 --> 00:05:35.696 fate of this palamus D MP4 and F

NOTE Confidence: 0.950317

00:05:35.696 --> 00:05:37.620 Jeff and the Sony catch up pathway.

NOTE Confidence: 0.950317

00:05:37.620 --> 00:05:40.050 Actually the Andre shows all the

NOTE Confidence: 0.950317

00:05:40.050 --> 00:05:42.757 chip chip based kind of gradient is

NOTE Confidence: 0.950317

00:05:42.757 --> 00:05:45.545 great but in our lab we don't have

NOTE Confidence: 0.950317

00:05:45.545 --> 00:05:48.393 this machine and chip and we use our.

NOTE Confidence: 0.950317

00:05:48.400 --> 00:05:50.184 Kind of a human hand to to kind

NOTE Confidence: 0.950317

00:05:50.184 --> 00:05:52.024 of give a different gradient of

NOTE Confidence: 0.950317

00:05:52.024 --> 00:05:53.455 those the growth factors.

NOTE Confidence: 0.950317

00:05:53.455 --> 00:05:56.010 So basically the app D MP4 and

NOTE Confidence: 0.950317

00:05:56.084 --> 00:05:58.419 after signal induced dorsal fate

NOTE Confidence: 0.950317

00:05:58.419 --> 00:06:01.234 of diencephalone and Sony catch a

NOTE Confidence: 0.950317

00:06:01.234 --> 00:06:03.259 pathway actually induced the ventral

NOTE Confidence: 0.950317

00:06:03.259 --> 00:06:05.466 fate of the diencephalic development.

NOTE Confidence: 0.950317

00:06:05.466 --> 00:06:08.917 So the very simple idea is that

NOTE Confidence: 0.950317

00:06:08.917 --> 00:06:11.719 oh maybe we could regulate the

NOTE Confidence: 0.950317

00:06:11.720 --> 00:06:14.989 maybe the the this the absence of

NOTE Confidence: 0.950317

00:06:14.989 --> 00:06:17.919 presence of the growth factors.

NOTE Confidence: 0.950317

00:06:17.920 --> 00:06:20.111 BMTF Jeff and Sonic catch but also

NOTE Confidence: 0.950317

00:06:20.111 --> 00:06:22.828 if we change the the like a duration

NOTE Confidence: 0.950317

00:06:22.828 --> 00:06:25.781 and dosage of those we could develop

NOTE Confidence: 0.950317

00:06:25.781 --> 00:06:28.796 different type of diencephalic tissue.

NOTE Confidence: 0.950317

00:06:28.800 --> 00:06:31.380 So one of our starting point

NOTE Confidence: 0.950317

00:06:31.380 --> 00:06:33.856 was to the change in this,

NOTE Confidence: 0.950317

00:06:33.856 --> 00:06:36.280 I mean activate this BMT and

NOTE Confidence: 0.950317

00:06:36.280 --> 00:06:37.540 then accept signal.

NOTE Confidence: 0.950317

00:06:37.540 --> 00:06:40.028 So basically we induce the BMTF

NOTE Confidence: 0.950317

00:06:40.028 --> 00:06:42.356 Jeff signal to dorsolize as well

NOTE Confidence: 0.950317

00:06:42.356 --> 00:06:45.146 as we suppress only catch up to

NOTE Confidence: 0.950317

00:06:45.146 --> 00:06:46.702 dorsalize this diencephalic fade.

NOTE Confidence: 0.950317

00:06:46.702 --> 00:06:49.830 With a couple of month of their work

NOTE Confidence: 0.950317

00:06:49.907 --> 00:06:52.469 we found that some kind of organoid.

NOTE Confidence: 0.950317

00:06:52.470 --> 00:06:54.660 So here we tentatively named in

NOTE Confidence: 0.950317

00:06:54.660 --> 00:06:56.874 the pinion gland organoid and I

NOTE Confidence: 0.950317

00:06:56.874 --> 00:06:58.914 will show you some evidence that

NOTE Confidence: 0.950317

00:06:58.914 --> 00:07:00.910 they're really kind of pinion gland

NOTE Confidence: 0.950317

00:07:00.910 --> 00:07:02.910 contain the pinion gland cells.

NOTE Confidence: 0.919601785384616

00:07:05.990 --> 00:07:08.420 So through the developmental process

NOTE Confidence: 0.919601785384616

00:07:08.420 --> 00:07:11.855 studies we found that there are few

NOTE Confidence: 0.919601785384616

00:07:11.855 --> 00:07:15.096 marker that actually mark the pinion gland

NOTE Confidence: 0.919601785384616

00:07:15.096 --> 00:07:17.536 especially you can see that the CRX.

NOTE Confidence: 0.919601785384616

00:07:17.540 --> 00:07:21.532 And the bsx and L8X4 are mark that

NOTE Confidence: 0.919601785384616

00:07:21.532 --> 00:07:23.970 uniquely expresses in the pineal

NOTE Confidence: 0.919601785384616

00:07:23.970 --> 00:07:26.590 gland and of course when we do the

NOTE Confidence: 0.919601785384616

00:07:26.590 --> 00:07:28.499 immuno standing for these markers,

NOTE Confidence: 0.919601785384616

00:07:28.500 --> 00:07:31.460 so this otx 2 they they are actually

NOTE Confidence: 0.919601785384616

00:07:31.460 --> 00:07:34.098 the marker for the Diane Cephalon.

NOTE Confidence: 0.919601785384616

00:07:34.100 --> 00:07:36.964 So you can see both thalamic organoid and

NOTE Confidence: 0.919601785384616

00:07:36.964 --> 00:07:40.228 the PG or pineal gland organoid express.

NOTE Confidence: 0.919601785384616

00:07:40.230 --> 00:07:43.605 Otx 2 but CRX and BSX are only expresses

NOTE Confidence: 0.919601785384616

00:07:43.605 --> 00:07:46.581 and pinia glander one are suggesting

NOTE Confidence: 0.919601785384616

00:07:46.581 --> 00:07:50.147 that our pinia glander one are expresses

NOTE Confidence: 0.919601785384616

00:07:50.147 --> 00:07:52.840 the the protein that uniquely expresses

NOTE Confidence: 0.919601785384616

00:07:52.840 --> 00:07:55.829 in the pinia gland in our body.

NOTE Confidence: 0.919601785384616

00:07:55.830 --> 00:07:57.560 But I actually haven't introduced

NOTE Confidence: 0.919601785384616

00:07:57.560 --> 00:07:58.944 about the pinia gland.

NOTE Confidence: 0.919601785384616

00:07:58.950 --> 00:08:02.398 So pinia gland is maybe you are more.

NOTE Confidence: 0.919601785384616

00:08:02.400 --> 00:08:04.320 A lot of you are familiar

NOTE Confidence: 0.919601785384616

00:08:04.320 --> 00:08:05.280 with this melatonin,

NOTE Confidence: 0.919601785384616

00:08:05.280 --> 00:08:08.448 so pineal gland is one of the major brain

NOTE Confidence: 0.919601785384616

00:08:08.448 --> 00:08:11.296 region where you regulate the circadian

NOTE Confidence: 0.919601785384616

00:08:11.296 --> 00:08:13.716 cycle by producing the melatonin.

NOTE Confidence: 0.919601785384616

00:08:13.720 --> 00:08:15.080 So as I show somebody,

NOTE Confidence: 0.919601785384616

00:08:15.080 --> 00:08:17.676 basically the daytime suppressed,

NOTE Confidence: 0.919601785384616

00:08:17.676 --> 00:08:20.272 but the nighttime actually

NOTE Confidence: 0.919601785384616

00:08:20.272 --> 00:08:22.270 stimulate this retina.

NOTE Confidence: 0.919601785384616

00:08:22.270 --> 00:08:24.742 And this signal goes through this

NOTE Confidence: 0.919601785384616

00:08:24.742 --> 00:08:28.118 complex like a few steps SCN in the

NOTE Confidence: 0.919601785384616

00:08:28.118 --> 00:08:30.198 hypothalamus and the superior cervical

NOTE Confidence: 0.919601785384616

00:08:30.198 --> 00:08:32.578 ganglion region and signal to the

NOTE Confidence: 0.919601785384616

00:08:32.578 --> 00:08:34.428 pineal gland to produce melatonin.

NOTE Confidence: 0.919601785384616

00:08:34.430 --> 00:08:38.325 So basically the like a the pineal

NOTE Confidence: 0.919601785384616

00:08:38.325 --> 00:08:41.246 gland is a major brain region that

NOTE Confidence: 0.919601785384616

00:08:41.246 --> 00:08:43.906 produce melatonin and and this

NOTE Confidence: 0.919601785384616

00:08:43.906 --> 00:08:47.347 melatonin production is the regulated

NOTE Confidence: 0.919601785384616

00:08:47.347 --> 00:08:50.209 by multiple steps by these engines.

NOTE Confidence: 0.919601785384616

00:08:50.210 --> 00:08:54.210 From tip to pen to the selatonin to

NOTE Confidence: 0.919601785384616

00:08:54.210 --> 00:08:58.410 melatonin through TPH and some other genes.

NOTE Confidence: 0.919601785384616

00:08:58.410 --> 00:09:00.846 So we looked at them and then

NOTE Confidence: 0.919601785384616

00:09:00.846 --> 00:09:02.914 compared with the dalamic organoid.

NOTE Confidence: 0.919601785384616

00:09:02.914 --> 00:09:06.498 The pineal gland organoid expresses all of

NOTE Confidence: 0.919601785384616

00:09:06.498 --> 00:09:09.847 this enzyme that produced the melatonin.

NOTE Confidence: 0.919601785384616

00:09:09.850 --> 00:09:12.162 And of course we also look at the

NOTE Confidence: 0.919601785384616

00:09:12.162 --> 00:09:13.950 production of melatonin and this

NOTE Confidence: 0.919601785384616

00:09:13.950 --> 00:09:16.242 pinia gland when I produce melatonin,

NOTE Confidence: 0.919601785384616

00:09:16.250 --> 00:09:18.040 but not the dalamic organoid.

NOTE Confidence: 0.919601785384616

00:09:18.040 --> 00:09:20.686 So we are in the process of the like

NOTE Confidence: 0.919601785384616

00:09:20.686 --> 00:09:22.478 looking at the, the regulation,

NOTE Confidence: 0.919601785384616

00:09:22.478 --> 00:09:24.873 how the melatonin production is

NOTE Confidence: 0.919601785384616

00:09:24.873 --> 00:09:27.098 regulated now pineal gland organoid

NOTE Confidence: 0.919601785384616

00:09:27.098 --> 00:09:29.611 and also we are thinking that how

NOTE Confidence: 0.919601785384616

00:09:29.611 --> 00:09:32.701 we study the function of this pineal

NOTE Confidence: 0.919601785384616

00:09:32.701 --> 00:09:34.848 gland organoid or pinealocyte that

NOTE Confidence: 0.919601785384616

00:09:34.848 --> 00:09:36.320 produces melatonin in vivo.

NOTE Confidence: 0.919601785384616

00:09:36.320 --> 00:09:39.086 So such as transplanting into the

NOTE Confidence: 0.919601785384616

00:09:39.086 --> 00:09:42.180 mouse brain or the animal brain.

NOTE Confidence: 0.919601785384616

00:09:42.180 --> 00:09:44.700 And we are also interested in because

NOTE Confidence: 0.919601785384616

00:09:44.700 --> 00:09:47.376 this if you imagine that the melatonin,

NOTE Confidence: 0.919601785384616

00:09:47.380 --> 00:09:49.704 one of the major role of melatonin

NOTE Confidence: 0.919601785384616

00:09:49.704 --> 00:09:51.858 is regulating the date night cycle.

NOTE Confidence: 0.919601785384616

00:09:51.860 --> 00:09:54.156 But even the features during the field

NOTE Confidence: 0.919601785384616

00:09:54.156 --> 00:09:56.116 of development, melatonin is produced.

NOTE Confidence: 0.919601785384616

00:09:56.116 --> 00:09:58.276 So basically melatonin seems have

NOTE Confidence: 0.919601785384616

00:09:58.276 --> 00:10:01.164 a really important function in the

NOTE Confidence: 0.919601785384616

00:10:01.164 --> 00:10:02.140 brain development.

NOTE Confidence: 0.919601785384616

00:10:02.140 --> 00:10:04.756 So we are also looking at the function

NOTE Confidence: 0.919601785384616

00:10:04.756 --> 00:10:08.246 of the melatonin in the cortical development.

NOTE Confidence: 0.919601785384616

00:10:08.250 --> 00:10:10.090 So for the short summary for this part,

NOTE Confidence: 0.919601785384616

00:10:10.090 --> 00:10:13.915 we could dorsalize this diansa

NOTE Confidence: 0.919601785384616

00:10:13.915 --> 00:10:17.094 polyglobalnoid using using the vmp and

NOTE Confidence: 0.919601785384616

00:10:17.094 --> 00:10:20.240 F geff signal and this produced pineal

NOTE Confidence: 0.919601785384616

00:10:20.240 --> 00:10:22.592 glandoganoid and pineal glandogano

NOTE Confidence: 0.919601785384616

00:10:22.592 --> 00:10:25.546 kind of expressed pineal gland specific

NOTE Confidence: 0.919601785384616

00:10:25.546 --> 00:10:28.210 genes and protein and produced melatonin.

NOTE Confidence: 0.95031711

00:10:30.240 --> 00:10:32.599 And then the right natural custom becomes,

NOTE Confidence: 0.95031711

00:10:32.600 --> 00:10:34.960 can we really that we may, we torsolize,

NOTE Confidence: 0.95031711

00:10:34.960 --> 00:10:37.620 but can we actually ventralize the like

NOTE Confidence: 0.95031711

00:10:37.620 --> 00:10:40.640 a dilamigo 108 or a balance of Polygon?

NOTE Confidence: 0.95031711

00:10:40.640 --> 00:10:42.880 Going back to the diagram,

NOTE Confidence: 0.95031711

00:10:42.880 --> 00:10:46.548 I already introduced that the Sonic hedgehog

NOTE Confidence: 0.95031711

00:10:46.548 --> 00:10:50.570 cooler induced ventralization of the.

NOTE Confidence: 0.95031711

00:10:50.570 --> 00:10:51.954 Ions at polic fade.

NOTE Confidence: 0.95031711

00:10:51.954 --> 00:10:54.817 So basically that what we really did, OK,

NOTE Confidence: 0.95031711

00:10:54.817 --> 00:10:57.946 so we added the sonycatcher to ventralize

NOTE Confidence: 0.95031711

00:10:57.946 --> 00:11:00.489 the developing dyansa polic organoid

NOTE Confidence: 0.950317106666667

00:11:02.930 --> 00:11:04.730 and of course this sonycatcher

NOTE Confidence: 0.950317106666667

00:11:04.730 --> 00:11:06.170 induced the ventral fade.

NOTE Confidence: 0.950317106666667

00:11:06.170 --> 00:11:10.595 So here we stay in the the talmic organoid

NOTE Confidence: 0.950317106666667

00:11:10.595 --> 00:11:13.617 as well as sort of like a ventralized

NOTE Confidence: 0.950317106666667

00:11:13.617 --> 00:11:16.359 talmic organoid with lhx two and

NOTE Confidence: 0.950317106666667

00:11:16.359 --> 00:11:19.706 elastic 5 and Elastic 5 mark the like.

NOTE Confidence: 0.950317106666667

00:11:19.710 --> 00:11:22.601 The ventral thalamic tissue and as you

NOTE Confidence: 0.950317106666667

00:11:22.601 --> 00:11:25.198 can see the Sonic ketchup treatment

NOTE Confidence: 0.950317106666667

00:11:25.198 --> 00:11:28.825 induces the lhx 5 but not getting the

NOTE Confidence: 0.950317106666667

00:11:28.825 --> 00:11:31.715 like dilamic organoid and of course

NOTE Confidence: 0.950317106666667

00:11:31.715 --> 00:11:34.829 dalamico one Express 2 which is doso

NOTE Confidence: 0.950317106666667

00:11:34.830 --> 00:11:36.790 marking the doso part of the thalamus.

NOTE Confidence: 0.855688541666667

00:11:39.670 --> 00:11:41.692 So one of the question actually

NOTE Confidence: 0.855688541666667

00:11:41.692 --> 00:11:43.852 that we had was let's sustain

NOTE Confidence: 0.855688541666667

00:11:43.852 --> 00:11:46.060 the over and over with the.

NOTE Confidence: 0.855688541666667

00:11:46.060 --> 00:11:48.364 The neuronal marker that for the

NOTE Confidence: 0.855688541666667

00:11:48.364 --> 00:11:49.900 excitatory and inhibitory neuron.

NOTE Confidence: 0.855688541666667

00:11:49.900 --> 00:11:51.900 So here we stain carva.

NOTE Confidence: 0.855688541666667

00:11:51.900 --> 00:11:54.114 Of course the carva mark the

NOTE Confidence: 0.855688541666667

00:11:54.114 --> 00:11:56.063 inhibitory neuron and the glue

NOTE Confidence: 0.855688541666667

00:11:56.063 --> 00:11:58.058 to mark the excitatory neuron.

NOTE Confidence: 0.855688541666667

00:11:58.060 --> 00:11:58.780 As you can see here,

NOTE Confidence: 0.855688541666667

00:11:58.780 --> 00:12:01.577 is it dramatic that the balamic

NOTE Confidence: 0.855688541666667

00:12:01.577 --> 00:12:03.762 organoid mainly composed of the

NOTE Confidence: 0.855688541666667

00:12:03.762 --> 00:12:06.008 neuron for the excitatory neuron

NOTE Confidence: 0.855688541666667

00:12:06.008 --> 00:12:08.128 and the ventralized balamic organoid

NOTE Confidence: 0.855688541666667

00:12:08.128 --> 00:12:10.932 contains the car by expressing cells

NOTE Confidence: 0.855688541666667

00:12:10.932 --> 00:12:13.527 suggesting that they are interneuron.

NOTE Confidence: 0.855688541666667

00:12:13.530 --> 00:12:15.954 And of course these days you have to

NOTE Confidence: 0.855688541666667

00:12:15.954 --> 00:12:18.858 do the single cell RNA sick and we

NOTE Confidence: 0.855688541666667

00:12:18.858 --> 00:12:21.686 performed that and made a new map

NOTE Confidence: 0.855688541666667

00:12:21.686 --> 00:12:23.650 that unbiased the clustering based

NOTE Confidence: 0.855688541666667

00:12:23.650 --> 00:12:26.418 on the gene expression so we could

NOTE Confidence: 0.855688541666667

00:12:26.418 --> 00:12:29.282 identify the major cell type in the brain.

NOTE Confidence: 0.855688541666667

00:12:29.290 --> 00:12:31.402 So starting with astrocyte,

NOTE Confidence: 0.855688541666667

00:12:31.402 --> 00:12:34.474 the glial progenitors and the dilamic

NOTE Confidence: 0.855688541666667

00:12:34.474 --> 00:12:37.018 progenitor and then even actually we

NOTE Confidence: 0.855688541666667

00:12:37.018 --> 00:12:41.074 could define the ependymal cells and here.

NOTE Confidence: 0.855688541666667

00:12:41.074 --> 00:12:42.466 Very interestingly,

NOTE Confidence: 0.855688541666667

00:12:42.470 --> 00:12:45.186 we could define of course excitatory neuron,

NOTE Confidence: 0.855688541666667

00:12:45.190 --> 00:12:47.926 but we we found two different

NOTE Confidence: 0.855688541666667

00:12:47.926 --> 00:12:49.750 elevatory neuron clusters here.

NOTE Confidence: 0.93220288

00:12:52.020 --> 00:12:55.536 So when we split the the you may into

NOTE Confidence: 0.93220288

00:12:55.536 --> 00:12:57.390 the group like a thalamic organoid

NOTE Confidence: 0.93220288

00:12:57.459 --> 00:12:59.219 or ventral thalamic organoid,

NOTE Confidence: 0.93220288

00:12:59.220 --> 00:13:01.638 of course this in inhibitory neural

NOTE Confidence: 0.93220288

00:13:01.638 --> 00:13:03.745 neural clusters are enriched in

NOTE Confidence: 0.93220288

00:13:03.745 --> 00:13:05.457 the ventral thalamic organoids.

NOTE Confidence: 0.93220288

00:13:05.460 --> 00:13:07.511 So it's a very interesting that we

NOTE Confidence: 0.93220288

00:13:07.511 --> 00:13:09.243 saw the carbonage neuron enriched

NOTE Confidence: 0.93220288

00:13:09.243 --> 00:13:11.218 in the ventral thalamic organoid.

NOTE Confidence: 0.93220288

00:13:11.220 --> 00:13:14.100 But there are two different individual

NOTE Confidence: 0.93220288

00:13:14.100 --> 00:13:18.312 neural clusters and again the we need a

NOTE Confidence: 0.93220288

00:13:18.312 --> 00:13:21.100 lot of literature such trying to understand.

NOTE Confidence: 0.93220288

00:13:21.100 --> 00:13:22.904 Science of public development

NOTE Confidence: 0.93220288

00:13:22.904 --> 00:13:24.257 process and structure,

NOTE Confidence: 0.93220288

00:13:24.260 --> 00:13:26.568 development process and function.

NOTE Confidence: 0.93220288

00:13:26.568 --> 00:13:29.453 And as a pick summary,

NOTE Confidence: 0.93220288

00:13:29.460 --> 00:13:32.726 so it's known that the thalamus

NOTE Confidence: 0.93220288

00:13:32.726 --> 00:13:34.656 is a lot of nuclei.

NOTE Confidence: 0.93220288

00:13:34.660 --> 00:13:37.420 So those in nuclei receive information

NOTE Confidence: 0.93220288

00:13:37.420 --> 00:13:40.729 or send the information to and from to

NOTE Confidence: 0.93220288

00:13:40.729 --> 00:13:43.420 the cortex as well as peripheral tissue.

NOTE Confidence: 0.93220288

00:13:43.420 --> 00:13:46.588 OK, but there are also very

NOTE Confidence: 0.93220288

00:13:46.588 --> 00:13:48.700 interesting nuclei called here.

NOTE Confidence: 0.93220288

00:13:48.700 --> 00:13:51.548 Trm thalamic vaticanal nucleus.

NOTE Confidence: 0.93220288

00:13:51.548 --> 00:13:53.468 OK, so this is TRM.

NOTE Confidence: 0.93220288

00:13:53.468 --> 00:13:55.280 Regular TRM mainly composed of a

NOTE Confidence: 0.93220288

00:13:55.347 --> 00:13:57.142 carbonage neuron and from thalamus

NOTE Confidence: 0.93220288

00:13:57.142 --> 00:13:59.756 to the cortex there is a thalamic

NOTE Confidence: 0.93220288

00:13:59.756 --> 00:14:01.268 cortical projection which are

NOTE Confidence: 0.93220288

00:14:01.268 --> 00:14:03.304 the expected to the neuron.

NOTE Confidence: 0.93220288

00:14:03.304 --> 00:14:05.924 So this TRM carbonated neuron

NOTE Confidence: 0.93220288

00:14:05.924 --> 00:14:08.682 regulate the neural activity of

NOTE Confidence: 0.93220288

00:14:08.682 --> 00:14:11.592 this thalamic cortical or cortical

NOTE Confidence: 0.93220288

00:14:11.592 --> 00:14:13.338 thalamic projection neurons.

NOTE Confidence: 0.93220288

00:14:13.340 --> 00:14:14.172 OK, so.

NOTE Confidence: 0.93220288

00:14:14.172 --> 00:14:15.836 But the very interestingly,

NOTE Confidence: 0.93220288

00:14:15.840 --> 00:14:20.440 this TRM so around the and

NOTE Confidence: 0.93220288

00:14:20.440 --> 00:14:23.160 expresses a unique markers,

NOTE Confidence: 0.93220288

00:14:23.160 --> 00:14:29.760 it's called SST ECL one and SPT 1 esrgm RORB.

NOTE Confidence: 0.93220288

00:14:29.760 --> 00:14:32.028 So you may know notice that of

NOTE Confidence: 0.93220288

00:14:32.028 --> 00:14:34.156 course we look at these markers

NOTE Confidence: 0.93220288

00:14:34.156 --> 00:14:36.842 in our single cell data and as

NOTE Confidence: 0.93220288

00:14:36.842 --> 00:14:39.929 you can see here we had this

NOTE Confidence: 0.93220288

00:14:39.929 --> 00:14:42.819 interneuron 1 interneuron 2 clusters.

NOTE Confidence: 0.93220288

00:14:42.820 --> 00:14:45.016 And as you can see here,

NOTE Confidence: 0.93220288

00:14:45.020 --> 00:14:47.220 so in one cluster expresses

NOTE Confidence: 0.93220288

00:14:47.220 --> 00:14:49.420 most of these TRN markers,

NOTE Confidence: 0.93220288

00:14:49.420 --> 00:14:49.896 okay,

NOTE Confidence: 0.93220288

00:14:49.896 --> 00:14:52.276 so that thinks that we

NOTE Confidence: 0.93220288

00:14:52.276 --> 00:14:54.723 could define the cluster of

NOTE Confidence: 0.93220288

00:14:54.723 --> 00:14:57.417 interneuron one as a TRN cluster

NOTE Confidence: 0.931627828571429

00:14:59.780 --> 00:15:02.108 and we are trying to kind

NOTE Confidence: 0.931627828571429

00:15:02.108 --> 00:15:06.010 of understand how the.

NOTE Confidence: 0.931627828571429

00:15:06.010 --> 00:15:08.608 The TRM regulate the kind of

NOTE Confidence: 0.931627828571429

00:15:08.610 --> 00:15:09.388 thylamocortical corticothylamic

NOTE Confidence: 0.931627828571429

00:15:09.388 --> 00:15:11.333 projection by putting the multiple

NOTE Confidence: 0.931627828571429

00:15:11.333 --> 00:15:13.370 kind of a one or together.

NOTE Confidence: 0.931627828571429

00:15:13.370 --> 00:15:15.986 But also we are trying to use this

NOTE Confidence: 0.931627828571429

00:15:15.986 --> 00:15:18.882 system to study the gene for the

NOTE Confidence: 0.931627828571429

00:15:18.882 --> 00:15:21.042 associated with the autism spectrum

NOTE Confidence: 0.931627828571429

00:15:21.117 --> 00:15:23.647 disorder as well as schizophrenia.

NOTE Confidence: 0.931627828571429

00:15:23.650 --> 00:15:25.757 But I want to emphasize that this

NOTE Confidence: 0.931627828571429

00:15:25.757 --> 00:15:28.689 is one of the first example in the

NOTE Confidence: 0.931627828571429

00:15:28.689 --> 00:15:31.502 brain organoid field that the you

NOTE Confidence: 0.931627828571429

00:15:31.502 --> 00:15:34.704 could really generate the fine nuclei.

NOTE Confidence: 0.931627828571429

00:15:34.704 --> 00:15:38.039 And we stick to the kind of a region

NOTE Confidence: 0.931627828571429

00:15:38.039 --> 00:15:40.394 regionalized organoid in the like

NOTE Confidence: 0.931627828571429

00:15:40.394 --> 00:15:44.132 a Diane set Poly as well as like

NOTE Confidence: 0.931627828571429

00:15:44.132 --> 00:15:46.337 a talent set polyprain organoid,

NOTE Confidence: 0.931627828571429

00:15:46.340 --> 00:15:47.796 it's a functional assay.

NOTE Confidence: 0.931627828571429

00:15:47.796 --> 00:15:49.616 We measured a neural activity

NOTE Confidence: 0.931627828571429

00:15:49.616 --> 00:15:51.899 in the ventral dynamic organoid.

NOTE Confidence: 0.931627828571429

00:15:51.900 --> 00:15:54.672 So we used the Voltron to measure

NOTE Confidence: 0.931627828571429

00:15:54.672 --> 00:15:55.860 the voltage change.

NOTE Confidence: 0.931627828571429

00:15:55.860 --> 00:15:58.600 So we actually tried to

NOTE Confidence: 0.931627828571429

00:15:58.600 --> 00:15:59.696 use electrophysiology.

NOTE Confidence: 0.931627828571429

00:15:59.700 --> 00:16:01.681 We had a really hard time to

NOTE Confidence: 0.931627828571429

00:16:01.681 --> 00:16:03.553 measure the neural activity by

NOTE Confidence: 0.931627828571429

00:16:03.553 --> 00:16:04.996 using the electrophysiology.

NOTE Confidence: 0.931627828571429

00:16:05.000 --> 00:16:07.086 We also use the caching imaging and

NOTE Confidence: 0.931627828571429

00:16:07.086 --> 00:16:09.114 of course the caching imaging worked

NOTE Confidence: 0.931627828571429

00:16:09.114 --> 00:16:11.262 pretty well but because here the

NOTE Confidence: 0.931627828571429

00:16:11.262 --> 00:16:13.221 TRN contains the carbalizing neuron

NOTE Confidence: 0.931627828571429

00:16:13.221 --> 00:16:16.034 and the uniqueness for this TRN is

NOTE Confidence: 0.931627828571429

00:16:16.034 --> 00:16:19.524 that it shows like a bust busting

NOTE Confidence: 0.931627828571429

00:16:19.524 --> 00:16:21.948 activity which is very difficult to

NOTE Confidence: 0.931627828571429

00:16:21.948 --> 00:16:24.600 use the the cache imaging to measure.

NOTE Confidence: 0.931627828571429

00:16:24.600 --> 00:16:27.840 So that's the reason we use this Voltron

NOTE Confidence: 0.931627828571429

00:16:27.840 --> 00:16:32.230 and we use the AV driven the Voltron.

NOTE Confidence: 0.931627828571429

00:16:32.230 --> 00:16:34.176 And in fact the talamigo one other

NOTE Confidence: 0.931627828571429

00:16:34.176 --> 00:16:35.849 than the ventral talamigo one or

NOTE Confidence: 0.931627828571429

00:16:35.849 --> 00:16:37.406 and measured in neural activity.

NOTE Confidence: 0.931627828571429

00:16:37.406 --> 00:16:40.394 So as you can see here so this talamigo

NOTE Confidence: 0.931627828571429

00:16:40.394 --> 00:16:42.662 one or have some kind of activity,

NOTE Confidence: 0.931627828571429

00:16:42.670 --> 00:16:45.142 but this eventualized talamigo one always

NOTE Confidence: 0.931627828571429

00:16:45.142 --> 00:16:49.305 has a more Boston type of the activity.

NOTE Confidence: 0.931627828571429

00:16:49.305 --> 00:16:52.910 So we think that the maybe is

NOTE Confidence: 0.931627828571429

00:16:52.910 --> 00:16:56.200 a really great new system to.

NOTE Confidence: 0.931627828571429

00:16:56.200 --> 00:16:58.240 Kind of define the different

NOTE Confidence: 0.931627828571429

00:16:58.240 --> 00:16:59.644 diencephalic and the thalamic

NOTE Confidence: 0.931627828571429

00:16:59.644 --> 00:17:02.273 area and we're useful to to study

NOTE Confidence: 0.931627828571429

00:17:02.273 --> 00:17:04.117 neuropsychotic disorders that also

NOTE Confidence: 0.931627828571429

00:17:04.117 --> 00:17:05.961 especially the associated with

NOTE Confidence: 0.931627828571429

00:17:05.961 --> 00:17:08.425 the sleeping disorder for example

NOTE Confidence: 0.931627828571429

00:17:08.425 --> 00:17:10.364 because sleeping disorder TRN,

NOTE Confidence: 0.931627828571429

00:17:10.364 --> 00:17:12.784 galvanized urine TRN regulate the

NOTE Confidence: 0.931627828571429

00:17:12.784 --> 00:17:15.120 sensor information from peripheral body.

NOTE Confidence: 0.931627828571429

00:17:15.120 --> 00:17:17.720 So that will be important the

NOTE Confidence: 0.931627828571429

00:17:17.720 --> 00:17:21.080 brain region to study those things.

NOTE Confidence: 0.931627828571429

00:17:21.080 --> 00:17:22.464 So for summarize this,

NOTE Confidence: 0.931627828571429

00:17:22.464 --> 00:17:25.148 so we we found that Sony catcher

NOTE Confidence: 0.931627828571429

00:17:25.148 --> 00:17:27.798 induced ventralization of a thalamic

NOTE Confidence: 0.931627828571429

00:17:27.798 --> 00:17:30.612 organoid which produced the ventral

NOTE Confidence: 0.931627828571429

00:17:30.612 --> 00:17:33.049 thalamic organoid and this ventral

NOTE Confidence: 0.931627828571429

00:17:33.049 --> 00:17:35.064 thalamic organoid contains a TRN

NOTE Confidence: 0.931627828571429

00:17:35.064 --> 00:17:37.752 neuron and we are going to use this

NOTE Confidence: 0.931627828571429

00:17:37.752 --> 00:17:40.040 system to study zero such disorders.

NOTE Confidence: 0.936060408333333

00:17:42.250 --> 00:17:43.906 All right. So finally I want

NOTE Confidence: 0.936060408333333

00:17:43.906 --> 00:17:45.610 to give thanks to Reed van.

NOTE Confidence: 0.936060408333333

00:17:45.610 --> 00:17:47.926 So Reed van actually work almost

NOTE Confidence: 0.936060408333333

00:17:47.926 --> 00:17:49.930 everything that I presented today.

NOTE Confidence: 0.936060408333333

00:17:49.930 --> 00:17:52.688 So pineo glendo vannoid as well as

NOTE Confidence: 0.936060408333333

00:17:52.688 --> 00:17:54.490 Venter Talamigo vannoid project.

NOTE Confidence: 0.936060408333333

00:17:54.490 --> 00:17:56.790 So Venter Talamigo Vanno project

NOTE Confidence: 0.936060408333333

00:17:56.790 --> 00:17:59.076 was initiated by the Yang Fei.

NOTE Confidence: 0.936060408333333

00:17:59.076 --> 00:18:01.746 So who got the he is now assistant

NOTE Confidence: 0.936060408333333

00:18:01.746 --> 00:18:04.378 professor in the Shanghai Tech Coast and

NOTE Confidence: 0.936060408333333

00:18:04.378 --> 00:18:07.206 also Peter Walk on continuously walk on.

NOTE Confidence: 0.936060408333333

00:18:07.210 --> 00:18:08.940 But the Reed van actually

NOTE Confidence: 0.936060408333333

00:18:08.940 --> 00:18:10.324 finished up this project.

NOTE Confidence: 0.936060408333333

00:18:10.330 --> 00:18:12.458 We are trying to publish that one.

NOTE Confidence: 0.936060408333333

00:18:12.460 --> 00:18:13.340 All right. Thank you.