WEBVTT

NOTE duration: ”00:04:01.834”

NOTE Confidence: 0.97935545

00:00:05.519 --> 00:00:07.919 Consciousness is what's important to

NOTE Confidence: 0.97935545

00:00:07.919 --> 00:00:09.360 us. It's all the things

NOTE Confidence: 0.97935545

00:00:09.360 --> 00:00:11.119 that we're aware of. It's

NOTE Confidence: 0.97935545

00:00:11.119 --> 00:00:12.980 it's what, keeps us awake.

NOTE Confidence: 0.97935545

00:00:13.085 --> 00:00:14.545 It's what makes us experience

NOTE Confidence: 0.9939453

00:00:15.005 --> 00:00:16.625 our lives moment to moment.

NOTE Confidence: 0.99534607

00:00:17.005 --> 00:00:18.525 It's what makes us able

NOTE Confidence: 0.99534607

00:00:18.525 --> 00:00:19.805 to function in the world.

NOTE Confidence: 0.99534607

00:00:19.805 --> 00:00:20.845 It's really what makes us

NOTE Confidence: 0.99534607

00:00:20.845 --> 00:00:21.345 human.

NOTE Confidence: 0.9921875

00:00:22.605 --> 00:00:23.885 When people have seizures, they

NOTE Confidence: 0.9921875

00:00:23.885 --> 00:00:24.945 often lose consciousness.

NOTE Confidence: 0.9128052

00:00:25.690 --> 00:00:27.130 They are unpredictable. They can

NOTE Confidence: 0.9128052

00:00:27.130 --> 00:00:28.330 happen any time day or

NOTE Confidence: 0.9128052

00:00:28.330 --> 00:00:30.750 night and have devastating consequences

NOTE Confidence: 0.9128052

00:00:30.970 --> 00:00:32.510 for people's quality of life.

NOTE Confidence: 0.9498698

00:00:37.050 --> 00:00:38.170 Our lab is interested in

NOTE Confidence: 0.9498698

00:00:38.170 --> 00:00:38.670 understanding

NOTE Confidence: 0.96569824

00:00:39.050 --> 00:00:39.870 normal consciousness,

NOTE Confidence: 0.9562988

00:00:40.545 --> 00:00:42.245 understanding how that is disrupted

NOTE Confidence: 0.9562988

00:00:42.305 --> 00:00:43.685 in disorders like epilepsy,

NOTE Confidence: 0.9759318

00:00:44.465 --> 00:00:45.745 and finally, how to try

NOTE Confidence: 0.9759318

00:00:45.745 --> 00:00:47.284 to improve or restore consciousness

NOTE Confidence: 0.9759318

00:00:47.505 --> 00:00:48.565 using therapeutic

NOTE Confidence: 0.97094727

00:00:48.945 --> 00:00:50.565 methods like brain stimulation.

NOTE Confidence: 0.956901

00:00:51.425 --> 00:00:53.040 Consciousness depends on huge huge

NOTE Confidence: 0.956901

00:00:53.040 --> 00:00:54.320 networks in the brain, including

NOTE Confidence: 0.956901

00:00:54.320 --> 00:00:55.360 both the surface of the

NOTE Confidence: 0.956901

00:00:55.360 --> 00:00:56.480 brain or the cortex and

NOTE Confidence: 0.956901

00:00:56.480 --> 00:00:57.680 also deep structures in the

NOTE Confidence: 0.956901

00:00:57.680 --> 00:00:58.879 brain like the thalamus and

NOTE Confidence: 0.956901

00:00:58.879 --> 00:01:00.480 brain stem. The deep structures

NOTE Confidence: 0.956901

00:01:00.480 --> 00:01:01.940 in the brain are critical

NOTE Confidence: 0.956901

00:01:02.079 --> 00:01:03.940 for consciousness because they provide

NOTE Confidence: 0.9501953

00:01:04.560 --> 00:01:06.420 modulatory and arousal functions.

NOTE Confidence: 0.9576552

00:01:07.005 --> 00:01:08.284 And that's a key aspect

NOTE Confidence: 0.9576552

00:01:08.284 --> 00:01:09.805 of consciousness is being awake

NOTE Confidence: 0.9576552

00:01:09.805 --> 00:01:11.345 and being alert. And that's

NOTE Confidence: 0.9576552

00:01:11.485 --> 00:01:13.025 modulated and regulated

NOTE Confidence: 0.9233238

00:01:13.645 --> 00:01:15.244 on long timescales, for example,

NOTE Confidence: 0.9233238

00:01:15.244 --> 00:01:16.205 when you're asleep or when

NOTE Confidence: 0.9233238

00:01:16.205 --> 00:01:17.165 you're awake or when you're

NOTE Confidence: 0.9233238

00:01:17.165 --> 00:01:18.525 in a coma, when you're

NOTE Confidence: 0.9233238

00:01:18.525 --> 00:01:19.405 in a normal state of

NOTE Confidence: 0.9233238

00:01:19.405 --> 00:01:21.660 consciousness, or anesthesia or seizures.

NOTE Confidence: 0.9233238

00:01:21.820 --> 00:01:23.360 And also on shorter timescales,

NOTE Confidence: 0.9233238

00:01:23.420 --> 00:01:24.320 moment to moment,

NOTE Confidence: 0.95606875

00:01:24.700 --> 00:01:26.220 that affects what we're conscious

NOTE Confidence: 0.95606875

00:01:26.220 --> 00:01:27.340 of and what we're not

NOTE Confidence: 0.95606875

00:01:27.340 --> 00:01:29.600 conscious of. And that's controlled

NOTE Confidence: 0.95606875

00:01:29.820 --> 00:01:31.180 to a large extent by

NOTE Confidence: 0.95606875

00:01:31.180 --> 00:01:33.100 cortical circuits interacting with these

NOTE Confidence: 0.95606875

00:01:33.100 --> 00:01:34.220 deep structures in the brain,

NOTE Confidence: 0.95606875

00:01:34.220 --> 00:01:35.340 including the thalamus of the

NOTE Confidence: 0.95606875

00:01:35.340 --> 00:01:37.084 brain stem are multiple parallel

NOTE Confidence: 0.95606875

00:01:37.084 --> 00:01:38.525 systems that play this key

NOTE Confidence: 0.95606875

00:01:38.525 --> 00:01:40.385 role in controlling and regulating

NOTE Confidence: 0.95606875

00:01:40.444 --> 00:01:41.185 our consciousness.

NOTE Confidence: 0.9814166

00:01:47.005 --> 00:01:48.765 We use brain imaging as

NOTE Confidence: 0.9814166

00:01:48.765 --> 00:01:50.045 a key method to look

NOTE Confidence: 0.9814166

00:01:50.045 --> 00:01:51.860 at big scale circuits in

NOTE Confidence: 0.9814166

00:01:51.860 --> 00:01:52.440 the brain.

NOTE Confidence: 0.9756592

00:01:52.979 --> 00:01:54.840 We also use electrical recordings,

NOTE Confidence: 0.9756592

00:01:54.900 --> 00:01:56.180 which gives us much better

NOTE Confidence: 0.9756592

00:01:56.180 --> 00:01:57.780 resolution in time and more

NOTE Confidence: 0.9756592

00:01:57.780 --> 00:01:59.479 direct measurements of the activity

NOTE Confidence: 0.9995117

00:01:59.940 --> 00:02:01.700 of brain cells and brain

NOTE Confidence: 0.9995117

00:02:01.700 --> 00:02:02.200 circuits.

NOTE Confidence: 0.95486885

00:02:02.820 --> 00:02:04.900 We also measure in animal

NOTE Confidence: 0.95486885

00:02:04.900 --> 00:02:05.799 models neurotransmitters

NOTE Confidence: 0.9549764

00:02:06.259 --> 00:02:07.725 and neurons and look at

NOTE Confidence: 0.9549764

00:02:07.805 --> 00:02:08.605 at things on a very

NOTE Confidence: 0.9549764

00:02:08.605 --> 00:02:09.505 fundamental level.

NOTE Confidence: 0.96531844

00:02:10.365 --> 00:02:12.205 And in people, we look

NOTE Confidence: 0.96531844

00:02:12.205 --> 00:02:14.065 at other metrics of consciousness

NOTE Confidence: 0.96531844

00:02:14.125 --> 00:02:15.645 and of function and of

NOTE Confidence: 0.96531844

00:02:15.645 --> 00:02:16.864 brain activity, including

NOTE Confidence: 0.9595337

00:02:17.165 --> 00:02:19.005 eye movements, subtle dilation of

NOTE Confidence: 0.9595337

00:02:19.005 --> 00:02:20.364 the pupil, and blinks and

NOTE Confidence: 0.9595337

00:02:20.364 --> 00:02:21.565 tiny movements of the eyes

NOTE Confidence: 0.9595337

00:02:21.565 --> 00:02:22.605 called saccades. It can give

NOTE Confidence: 0.9595337

00:02:22.605 --> 00:02:24.419 us clues about what's happening

NOTE Confidence: 0.9595337

00:02:24.419 --> 00:02:26.340 during normal consciousness and impaired

NOTE Confidence: 0.9595337

00:02:26.340 --> 00:02:26.840 consciousness.

NOTE Confidence: 0.9818892

00:02:27.300 --> 00:02:28.419 And then we use machine

NOTE Confidence: 0.9818892

00:02:28.419 --> 00:02:30.099 learning and artificial intelligence to

NOTE Confidence: 0.9818892

00:02:30.099 --> 00:02:30.599 decode

NOTE Confidence: 0.94849575

00:02:30.980 --> 00:02:32.980 all these signals and understand

NOTE Confidence: 0.94849575

00:02:32.980 --> 00:02:33.860 what's going on in the

NOTE Confidence: 0.94849575

00:02:33.860 --> 00:02:34.900 brain and also what's going

NOTE Confidence: 0.94849575

00:02:34.900 --> 00:02:36.180 on with these surrogate markers

NOTE Confidence: 0.94849575

00:02:36.180 --> 00:02:37.405 like the the eye movements

NOTE Confidence: 0.94849575

00:02:37.405 --> 00:02:38.125 to be able to do

NOTE Confidence: 0.94849575

00:02:38.125 --> 00:02:39.644 things like knowing if someone's

NOTE Confidence: 0.94849575

00:02:39.644 --> 00:02:40.525 conscious or not of a

NOTE Confidence: 0.94849575

00:02:40.525 --> 00:02:42.204 particular stimulus without even asking

NOTE Confidence: 0.94849575

00:02:42.204 --> 00:02:43.405 them just based on their

NOTE Confidence: 0.94849575

00:02:43.405 --> 00:02:44.064 eye movements.

NOTE Confidence: 0.96449906

00:02:49.340 --> 00:02:50.860 We've just completed a clinical

NOTE Confidence: 0.96449906

00:02:50.860 --> 00:02:52.700 trial where people with a

NOTE Confidence: 0.96449906

00:02:52.700 --> 00:02:54.219 particular type of seizures, temporal

NOTE Confidence: 0.96449906

00:02:54.219 --> 00:02:54.959 lobe seizures.

NOTE Confidence: 0.9434611

00:02:55.340 --> 00:02:57.500 We implanted devices in patients

NOTE Confidence: 0.9434611

00:02:57.500 --> 00:02:59.260 where during those seizures, we

NOTE Confidence: 0.9434611

00:02:59.260 --> 00:03:00.299 first tried to stop the

NOTE Confidence: 0.9434611

00:03:00.299 --> 00:03:02.060 seizures with brain stimulation, like

NOTE Confidence: 0.9434611

00:03:02.060 --> 00:03:03.439 the way a defibrillator

NOTE Confidence: 0.9859009

00:03:03.739 --> 00:03:05.475 or a pacemaker works.

NOTE Confidence: 0.9719303

00:03:05.935 --> 00:03:06.895 If that didn't work, we

NOTE Confidence: 0.9719303

00:03:06.895 --> 00:03:07.935 had a second mode of

NOTE Confidence: 0.9719303

00:03:07.935 --> 00:03:09.615 stimulation, which was triggered by

NOTE Confidence: 0.9719303

00:03:09.615 --> 00:03:11.935 seizures that weren't successfully stopped

NOTE Confidence: 0.9719303

00:03:11.935 --> 00:03:13.455 and stimulated the thalamus to

NOTE Confidence: 0.9719303

00:03:13.455 --> 00:03:14.495 try to wake people up

NOTE Confidence: 0.9719303

00:03:14.495 --> 00:03:15.615 and make them more conscious

NOTE Confidence: 0.9719303

00:03:15.615 --> 00:03:17.660 during seizures. And we measured

NOTE Confidence: 0.9719303

00:03:17.660 --> 00:03:20.139 their behavior using smart, watch

NOTE Confidence: 0.9719303

00:03:20.139 --> 00:03:22.300 technology at home and monitored

NOTE Confidence: 0.9719303

00:03:22.300 --> 00:03:23.180 how well they were able

NOTE Confidence: 0.9719303

00:03:23.180 --> 00:03:24.620 to respond and interact during

NOTE Confidence: 0.9719303

00:03:24.620 --> 00:03:26.300 the seizures with or without

NOTE Confidence: 0.9719303

00:03:26.300 --> 00:03:27.740 this additional stimulation of the

NOTE Confidence: 0.9719303

00:03:27.740 --> 00:03:29.120 deep structures of the brain.

NOTE Confidence: 0.97681427

00:03:30.584 --> 00:03:32.105 Remarkably, we found that this

NOTE Confidence: 0.97681427

00:03:32.105 --> 00:03:33.544 treatment really helped the patients,

NOTE Confidence: 0.97681427

00:03:33.544 --> 00:03:35.465 really helped them improve their

NOTE Confidence: 0.97681427

00:03:35.465 --> 00:03:35.965 behavior,

NOTE Confidence: 0.98938805

00:03:36.265 --> 00:03:37.944 their responsiveness, and their ability

NOTE Confidence: 0.98938805

00:03:37.944 --> 00:03:38.905 to interact with the world

NOTE Confidence: 0.98938805

00:03:38.905 --> 00:03:40.204 during and after the seizures.

NOTE Confidence: 0.9847819

00:03:40.504 --> 00:03:41.465 So that's the kind of

NOTE Confidence: 0.9847819

00:03:41.465 --> 00:03:41.965 treatment

NOTE Confidence: 0.96123046

00:03:42.345 --> 00:03:44.125 approach that we're exploring further,

NOTE Confidence: 0.98297316

00:03:44.590 --> 00:03:46.109 where we can hopefully understand

NOTE Confidence: 0.98297316

00:03:46.109 --> 00:03:47.310 the brain circuits that are

NOTE Confidence: 0.98297316

00:03:47.310 --> 00:03:48.670 involved in normal and impaired

NOTE Confidence: 0.98297316

00:03:48.670 --> 00:03:50.349 consciousness and intervene to try

NOTE Confidence: 0.98297316

00:03:50.349 --> 00:03:52.030 to help patients with epilepsy

NOTE Confidence: 0.98297316

00:03:52.030 --> 00:03:53.230 and with other types of

NOTE Confidence: 0.98297316

00:03:53.230 --> 00:03:53.730 disorders.