# Welcome to the **6<sup>th</sup> Human Single-Neuron Meeting 2022**

November 10-11, 2022 www.humansingleneuron.org

Program and organizing committee Ueli Rutishauser, PhD; Cedars-Sinai/Caltech (Chair), Nanthia Suthana, PhD; UCLA Itzhak Fried, MD PhD; UCLA Richard Andersen, PhD; Caltech Gabriel Kreiman, PhD; Boston Children's/Harvard

# **Venue and Host Institution**



Brain Research Institute Neuroscience Research Building University of California, Los Angeles 635 Charles E Young Drive South



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#### **Welcome**

I am delighted to welcome you to this year's human single neuron meeting. It is wonderful that we are able to all gather in person for the 6<sup>th</sup> meeting this year. Thank you very much to everybody who agreed to participate, we are delighted by the very strong interest of the community!

The goal of this bi-annual meeting is to bring together the community of scientists, physicians, ethicists, publishers, funders, companies, and engineers that jointly constitute the exciting new field of human single neuron recordings. The program features new results and developments in the field and closely adjacent work, including related animal and other human work. A key goal is to create new connections and interactions between adjacent fields, so we also invited researchers using other techniques and model systems that we believe have strong potential for new synergies. The program is mixture of regular invited talks, short talks and posters selected competitively from an open call, and ample opportunities for reconnecting and networking during the breaks, lunches, and dinner.

We would like to express our gratitude to the UCLA Brain Research Institute for hosting us this year in their beautiful venue and for all our sponsors for making this meeting possible.

On behalf of the entire organizing and program committee,

Ueli Rutishauser, PhD Chair of the 2022 program committee

#### **Schedule**

Vendor exhibits are located in NRB outside of the main auditorium till 4pm on the first day and throughout on the second day.

#### Day 1: Thursday, Nov 10

8:00-8:20	Check-In
8:20-8:30	Welcome & Orientation (Ueli Rutishauser on behalf of program committee)
8:30-10:30	Session 1: Social cognition and neuromodulation. Regular talks. Chair: Ralph Adolphs
08:30	Ziv Williams (MGH/Harvard) Studying social cognition in humans at cellular scale
09:00	Eyiyemisi Damisah (Yale University) Single neuron correlates of threat processing in humans
09:30	Katalin Gothard (University of Arizona) A context-dependent switch from sensing to feeling in the primate amygdala
10:00	Sameer Sheth (Baylor College of Medicine) Network-Minded Neuromodulation: EMU Utilization Beyond Epilepsy
10:30-11:00	Break
11:00-12:30	Session 2: Decision making, speech, and new technology. Short talks. Chair: Gabriel Kreiman
11:00	Arianna Neal (Mount Sinai) Neural computations underlying social mood
11:15	Zhongzheng Fu (Cedars-Sinai) The geometry of domain-general performance monitoring in the human medial frontal cortex
11:30	Keundong Lee (UCSD) Flexible, Scalable High Channel Count Stereo-Electrode for Recording in the Human Brain

Sarah Kim Wandelt (Caltech) Speech and internal speech decoding from populations of single neurons in a tetraplegic human
Matteo Vissani (MGH/Harvard) Speech-related spike-phase coupling of subthalamic neurons to the human cortex
Jay Gill (UCLA) Multi-Regional Single Neuron Dynamics Underlying Intertemporal Decision Making in Humans
Lunch
Session 3: Memory. Regular talks. Chair: Richard Andersen
Florian Mormann (University of Bonn, Germany) Concept neurons in the medial temporal lobe as semantic building blocks of memory
Josh Jacobs (Columbia University) Neuronal correlates of spatial memory encoding
Bradly Lega (UTSW) Organization of neuronal assemblies in the human MTL
Jan Kaminski (Nencki Institute of Experimental Biology, Poland) The Nature of Working Memory Buffer in Medial Temporal Lobe
Group photo outside NRB 2 <sup>nd</sup> floor
Walk over to Luskin (program in NRB ends at 1600 on first day)
Session 4: Posters and refreshments. Location: Luskin, Centennial Ballroom C-D (1 <sup>st</sup> floor).
Reception/Dinner. Location: Luskin, Centennial Terrace (3 <sup>rd</sup> floor).

# Day 2: Friday, Nov 11

7:30-8:00	Check In
8:00-10:00	Session 5: Executive/Decision and Visual perception. Regular Talks. Chair: Richard Andersen
8:00	Matthew Leonard (UCSF) Single neuron encoding of speech across cortical layers of the human superior temporal gyrus
8:30	Brett Foster (University of Pennsylvania) Single neuron selectivity for executive and episodic processing in human dorsal posterior cingulate
9:00	Jeffrey Schall (York U/Vanderbilt) The neural basis of EEG indices of performance monitoring
9:30	Biyu He (New York University) Neural mechanisms of conscious visual perception in humans
10:00-10:30	Break
10:30-12:00	Session 6: Temporal lobe function (Short talks). Chair: Ralph Adolphs
10:30	Doris E. Dijksterhuis (NIN, Netherlands) Cells in the human medial temporal lobe are reactivated by pronouns that refer to concepts to which they are tuned
10:45	Varun Wadia (Caltech & Cedars-Sinai) Characterizing visual imagery at single cell resolution in human Inferotemporal cortex

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11:00	Sabrina Maoz (UCLA/Caltech) Spatially-periodic stripe single-units identified in the human MTL and beyond during immersive virtual reality
11:15	Jie Zheng (BCH/Harvard) Combined rate-phase coding of human medial temporal lobe neurons at cognitive boundaries shapes episodic memory representations
11:30	Thomas Donoghue (Columbia University) Single neurons in the human medial temporal lobe engage in distinct aspects of different tasks
11:45	Shuo Wang (Washington University) Face and object coding in the human amygdala and hippocampus
12:00-13:30	Lunch
13:30-15:30	Session 7: Brain machine interfaces / movement (Regular Talks). Chair: Gabriel Kreiman
13:30	Richard Andersen (Caltech) Cognitive Neural Prosthetics
14:00	Robert Gaunt (U Pitt) Perceptual and functional effects of microstimulation in the human somatosensory cortex
14:30	Roozebeh Kiani (NYU) The neural code for movement kinematic and changes of ongoing movements in human subthalamic nucleus
15:00-15:30	<b>Special Session – BRAIN initiative</b> Jim Gnadt, NIH/NIHNDS The NIH BRAIN Initiative and Human Intracranial Neuroscience Research
15:30-16:00	Break
16:00-18:00	Session 8: New recording technology / ex-vivo. Regular Talks. Chair: Ueli Rutishauser
16:00	Angelique Paulk (MGH/Harvard) Spike waveforms and waves in the human brain with high resolution recording technologies
16:30	Dejan Markovic (UCLA) Neuro-stack: a wearable clinical research system for advanced closed-loop neuromodulation
17:00	Jennifer Gelinas (Columbia) Translational Organic Neural Interface Devices at Single Neuron Resolution
17:30	Taufik Valiante (U Toronto, Canada) Loss of Neuronal Heterogeneity in Epileptogenic Human Tissue Impairs Network Resilience to Sudden Changes in Synchrony

**Talk guidelines:** Regular Talks are 30min total (20min talk, 10min Q&A). Short talks are 15min in total (10min talk, 5 min Q&A). Please strictly adhere to your allocated talk time. Session chairs will provide warnings when time is about to be up and will have to interrupt talks if they go over. Speakers, please check that your system connects to the projector in the break prior to your session and if not transfer to the provided system.

#### Posters (Day 1, shown 4-7pm)

Location: Luskin Conference center, Centennial Ballroom C-D

#### Memory: Long-Term (Posters #1-9)

Jiali Zhang (NINDS, Oxford, United Kingdom), Spiking sequence fidelity in the human anterior temporal lobe predicts successful memory encoding and retrieval

**Jie Zheng** (BCH/Harvard), Combined rate-phase coding of human medial temporal lobe neurons at cognitive boundaries shapes episodic memory representations

Luca D. Kolibius (University of Glasgow, United Kingdom), Hippocampal neurons code individual episodic memories in humans

Lukas Kunz (Columbia), Ripple-locked coactivity of object and place cells supports human associative memory

Manuela Costa (University Politécnica de Madrid, Spain), Amygdala and hippocampus interactions guiding retrieval of aversive memories

**Mar Yebra** (Cedars-Sinai Medical Center), Evidence accumulation by single units in the human Medial Temporal Lobe (MTL) during memory-based decisions

**Marielle Darwin** (U Colorado Anschutz Medical Campus), Eye tracking and single-neuron responses associated with recognition memory task performance in humans with epilepsy

Mohammad Khazali (Freiburg University, Germany), Single-neuron representations of temporal order in the human medial temporal lobe

Wenying Zhu (Caltech), Distinct Cell Populations Encode Item Familiarity and Source Context for Human Face Recognition Memory

#### Memory: Working memory (Posters #10-12)

**Jonathan Daume** (Cedars-Sinai Medical Center), A single cell correlate of theta-gamma phase amplitude coupling during working memory in the human hippocampus

Rhiannon Cowan (U Utah), Dynamic encoding of target and distractor representations during working memory performance

**Stefanie Liebe** (U Hospital Tübingen), Theta-based spike-phase coding supports temporal-order working memory in the human medial temporal lobe and recurrent neural networks

#### <u>Memory: Medial temporal lobe</u> (Posters #13-17)

Alana Darcher (U Bonn, U Tübingen, Germany), Regional differences in single neuron timescales between static and dynamic stimuli in the human medial temporal lobe

Bita Samimizad (U Bonn, Germany), Single-neuron representations of ambiguous words in the human medial temporal lobe

**Doris E. Dijksterhuis** (NIN, The Netherlands), Cells in the human medial temporal lobe are reactivated by pronouns that refer to concepts to which they are tuned

Marcel Bausch (U Bonn, Germany), Distinct populations in human MTL combine items and contexts across temporal gaps

#### Executive function and decision making (Posters #18-26)

Amirsaman Sajad (Vanderbilt), Functional architecture of executive control in the medial frontal cortex and associated event-related potentials

Geeling Chau (Caltech), Paracingulate Sulcus presence affects single neuron responses to errors in human medial frontal cortex

**Hristos Courellis** (Caltech/UCLA), Static and Dynamic Representations of Task Context in Hippocampus and Medial Frontal Cortex Support Multi-Task Behavior

Jake Gavenas (Chapman), Spontaneous fluctuations in networks with slow synapses underlie early changes in firing rates before self-initiated actions

**Thomas Donoghue** (Columbia), Single neurons in the human medial temporal lobe engage in distinct aspects of different tasks"

Tomas Aquino (Caltech), Neurons in human pre-supplementary motor area encode key computations for value-based choice

**Zhongzheng Fu** (Cedars-Sinai Medical Center), The geometry of domain-general performance monitoring in the human medial frontal cortex

#### New Technology and methods (Posters #27-35)

Ahnaf Rashik Hassan (Columbia), Translational Organic Neural Interface Devices at Single Neuron Resolution

Christopher Kovach (U Iowa), Templates before detection: spike waveform identification with higher-order spectra

**Fernando Julian Chaure** (U Buenos Aires, Argentina), A new kernel for dynamic experimental paradigms based on single neuron responses in the human brain

Gábor Tamás (U Szeged, Hungary), Three dimensional high density electrode arrays allow identification of synaptically coupled human neurons in vivo

**Jihwan Lee** (UCSD), Ultra-Sharp, Individually Addressable Silicon-based Nanowire Arrays Natively Permeate, Record, and Stimulate Intracellular Activity in Neuronal and Cardiac Networks

Keundong Lee (UCSD), Flexible, Scalable High Channel Count Stereo-Electrode for Recording in the Human Brain

Sabera Talukder (Caltech), Deep Neural Imputation: A Framework for Recovering Incomplete Brain Recordings

**Vitalie Cervinschi** (Cedars-Sinai Medical Center), Inferring Transcriptomics, Electrophysiology and Morphology Cell Classes from Human Cortical Extracellular Single-Unit Recordings

**Youngbin Tchoe** (UCSD), Human Brain Mapping with Multi-Thousand Channel PtNRGrids Resolves Spatiotemporal Dynamics

#### Motor system (Posters #36-40)

Ahmad Alhourani (U Louisville), The Ventral intermediate nucleus of the thalamus cells encode diverse aspects of motor execution

Jessica McDonnell (U Louisville), STN subregion function during motor conflict in PD

**Leon Amadeus Steiner** (Krembil Research Institute - UHN, Canada), Synaptic building blocks underlying the subcortical circuit intervention of subthalamic deep brain stimulation

Luka Milosevic (U Toronto, Canada), Top-down control of human motor thalamic neuronal activity during the auditory oddball task

**Srdjan Sumarac** (U Toronto, Krembil Brain Institute, Canada), Machine learning approach for predicting severity of symptoms in Parkinson's disease from intraoperative single-neuron recordings

#### **Brain state and attention** (Posters #41-45)

Kelsey Sundby (NINDS), Attention modulates single-unit sequences in human ATL during memory encoding

Jacob Westerberg (Vanderbilt), The neural basis for an EEG index of attention

Araceli R. Cardenas (Krembil Research Institute - UHN, Canada), Nose and mouth breathing differentially entrain ripples and neuronal spiking activity in humans

Saman Abbaspoor (Vanderbilt), Hippocampal theta and gamma- band decoupling during mobility, visual search, and sleep in macaques

Shraddha Shah (U Rochester, BCM), Attentional modulation of spike count correlations among distinct categories of anatomically connected neurons in V1

#### Social cognition, emotions, and neuroethics (Posters #46-50)

Arianna Neal (Mount Sinai), Single neurons in the human substantia nigra encode social prediction errors

Salman Ehtesham Qasim (Mount Sinai), Neurons in the human brain encode emotional space

SeungHyun Lee (U Arizona), Neurons in the non-human primate amygdala respond to social status

Yoshiyuki Onuki (Jichi Medical University, Japan), Encoding of the pain intensity of others in human subthalamic nucleus

Ashley Feinsinger (UCLA), Through the Relational Lens: Improving Informed Consent for Intraoperative Research

#### Epilepsy / Mechanisms of disease (Posters #51-52)

**David Hunt** (Cedars-Sinai Medical Center), Multimodal Analysis of Non-Lesional Epilepsy in Humans: Single-Neuron Recordings In-Vivo & Single-Cell RNA-Sequencing Ex-Vivo

Edward Merricks (Columbia U Medical Center), Single neuron activity in the mesial temporal lobe during human seizures shows reduction of both excitatory and inhibitory firing

#### Stimulation (Posters #53-54)

Uma Mohan (NIH/NINDS), Characterizing single-neuron responses to multisite direct electrical brain stimulation in humans

**Yousef Salimpour** (JHU School of Medicine), Phase-dependent Neuromodulation of the Human Cortico-Basal ganglia– Thalamo–Cortical network

#### Brain Machine interfaces (Posters #55-61)

**David Bjånes** (Caltech), Scanning electron microscopy data of ten intracortical microelectrode arrays, previously implanted in three humans affected by tetraplegia for recording and stimulation of cortical networks

**Isabelle Rosenthal** (Caltech), Exploring the effects of multisensory information in S1 within and outside the cortical homunculus

Jonas B Zimmermann (Wyss Center for Bio and Neuroengineering, Switzerland), Intracortical BCI in a home use setting to enable communication by a person in completely locked-in state

José Vergara de la Fuente (BCM), Characterization of single unit and local field potential responses during bimanual touch in human somatosensory cortex

Kelly Kadlec (Caltech), Coding for movements across the body in human motor cortex and posterior parietal cortex

Luke Bashford (Caltech), Neural subspaces of imagined movements remain stable over several years in humans

Whitney Griggs (Caltech, UCLA), A Functional Ultrasound Brain-Machine Interface: Real-Time Decoding of Eight Movement Directions

#### Language and Semantics (Posters #62-71)

John H Wittig Jr. (NIH/NINDS), Distinct Rate and Sequence Codes for Semantic Information in Human ATL neurons

Kathryn Snyder (UTHealth Houston), A heteromodal cortical language network for lexical access

Kenji Ibayashi (Jichi Medical University, Japan), Olfactory naming related activities recorded from human entorhinal and speech cortices

Matteo Vissani (MGH/Harvard), Speech-related spike-phase coupling of subthalamic neurons to the human cortex

Matthew Nelson (U Alabama at Birmingham), Preferential activation for semantic content words in the left Anterior Temporal Lobe

Oscar Woolnough (UTHealth Houston), Two Spatiotemporally Distinct Cortical Networks for Sentence Reading

Sarah Kim Wandelt (Caltech), Speech and internal speech decoding from populations of single neurons in a tetraplegic human

**Sina Mackay** (U Hospital Bonn, Germany), Concept neurons in the medial temporal lobe represent the semantic building blocks of human memory

**Tessy M. Thomas** (UTHealth Houston), Decoding speech production from local field potentials using stereoelectroencephalography

Zsuzsanna Kocsis (U Iowa), Immediate Neural Impact and Compensation After Semantic Hub Disconnection

#### **Spatial cognition and memory (Posters #72-76)**

Sandra Maesta Pereira (Columbia), Conjunctive Encoding in Human Place and Time Cells

Hanga Dormán (U Texas), Representation of Three-Dimensional Space in the Human Hippocampus

Jorge Gamez (Caltech), Allocentric spatial representations in human posterior parietal cortex

Matthias Stangl (UCLA), Human grid-cell-like representations encode the location and movement of others

#### Sensory representations (Posters #77-84)

Joel Berger (U Iowa), Multi-unit responses to sound pitch recorded across Heschl's gyrus

Lou Blanpain (Emory, Georgia Tech), Sensory Flicker Modulates Single Neuron Activity in the Human Hippocampus and Cingulate

Nora Krenn (U Hospital Bonn, Germany), Human single-neuron dynamics during saccadic and smooth-pursuit eye movements

Puneeth N. Chakravarthula (WashU), A neuronal saliency map in the human amygdala and hippocampus

**Runnan Cao** (West Virginia University, WashU), Feature-based encoding of objects by single neurons in the human amygdala and hippocampus

**Thomas P. Reber** (U Bonn, Germany; UniDistance Suisse, Switzerland), Single-neuron mechanisms of neural adaptation in the human temporal lobe

Varun Wadia (Caltech, Cedars-Sinai Medical Center), Characterizing visual imagery at single cell resolution in human Inferotemporal cortex

Elliot Murphy (UTHealth Houston), Probing local cortical signatures of perceptible and imperceptible concepts

# NEUROSCIENCE INNOVATION

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Single Unit Symposium: Building a Successful Single Unit Research Group and Best Practices in Capturing Single Unit Recordings

Join us on Monday December 5th from 6-9 pm at AES 2022 at The Music City Center in Nashville, TN.

#### **Activities**

- Expert presentations feature renowned neurosurgeons, neurologists, and researchers
  Interactive expert panel discussions
- Hands on surgical and recording demonstrations



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## Featuring:

Dr. Itzhak Fried, MD, Ph.D. UCLA Medical Center, Los Angeles, CA, and Tel-Aviv University, Israel

Dr. A dam Mamelak, MD Cedars Sinai Medical Center, Los Angeles, CA

Cory Inman, Ph.D. Utah Health and The University of Utah, Salt Lake City, UT



# HSN'2022 Locations and floor plans

All talks, exhibits, breaks, and lunches will take place in the auditorium of the Neuroscience Research Building (NRB). The poster session, dinner and break on afternoon of first day will take place at the Luskin Conference Center. Both are located close-by on the UCLA campus. Walking distance between the two locations is a few minutes.



#### Refreshments t

#### Addresses

Neuroscience Research Building (NRB) 635 Charles E Young Drive South Los Angeles , CA 90095

Luskin Conference Center 425 Westwood Plaza Los Angeles 90095

**Parking:** Closest parking lot is P8, which has visitors parking on Level 4 ("pay by space" spots). A ticket can be purchased at self-service stations located throughout the parking structure or electronically, see

<u>https://transportation.ucla.edu/campus-</u> <u>parking/visitors</u>. Staff in the parking information kiosk (orange circle) can also be consulted.

#### **Poster Floor Plan**

Location: Luskin Conference center, Centennial Ballroom C-D

Posters are shown 4-7pm on the first day.

Map shows where to mount your poster. Each topic area of posters is assigned a block (i.e. 1-9 for Memory:Long-term). Pick any empty board within the block assigned to you to mount your poster.

<u>Acknowledgments.</u> We are immensely grateful for the support of the following institutions and individuals, without whom this event would not have been possible.

UCLA Brain Research Institute Joseph Quintero, UCLA Brain Research Institute Jasmine Serrano, UCLA Brain Research Institute David Bakalov, UCLA, Suthana Lab Michael Kyzar, Cedars-Sinai