[1]Highlightshighlights

Neural trajectories in the hippocampus exhibited greater variability during a working memory (WM) task compared to

M. A. Wilson, B. L. McNaughton, Reactivation of hippocampal ensemble memories during sleep, Science (New York, N.
Z. Ndasdy, H. Hirase, A. Czurk, J. Csicsvari, G. Buzski, Replay and Time Compression of Recurring Spike Sequences in
URL https://www.jneurosci.org/content/19/21/9497
A. K. Lee, M. A. Wilson, Memory of sequential experience in the hippocampus during slow wave sleep, Neuron 36 (6) (
K. Diba, G. Buzski, Forward and reverse hippocampal place-cell sequences during ripples, Nature Neuroscience 10 (10)
URL https://www.nature.com/articles/nn1961
T. J. Davidson, F. Kloosterman, M. A. Wilson, Hippocampal replay of extended experience, Neuron 63 (4) (2009) 497–
S. P. Jadhav, C. Kemere, P. W. German, L. M. Frank, Awake Hippocampal Sharp-Wave Ripples Support Spatial Memo
URL https://www.science.org/doi/abs/10.1126/science.1217230
G. Girardeau, K. Benchenane, S. I. Wiener, G. Buzski, M. B. Zugaro, Selective suppression of hippocampal ripples impa
URL http://www.nature.com/articles/nn.2384
V. Ego-Stengel, M. A. Wilson, Disruption of ripple-associated hippocampal activity during rest impairs spatial learning
A. Fernndez-Ruiz, A. Oliva, E. Fermino de Oliveira, F. Rocha-Almeida, D. Tingley, G. Buzski, Long-duration hippocam
URL https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6693581/
J. Kim, A. Joshi, L. Frank, K. Ganguly, Corticalhippocampal coupling during manifold exploration in motor cortex, Na
URL https://www.nature.com/articles/s41586-022-05533-z
C.-T. Wu, D. Haggerty, C. Kemere, D. Ji, Hippocampal awake replay in fear memory retrieval, Nature Neuroscience 20
Y. Norman, E. M. Yeagle, S. Khuvis, M. Harel, A. D. Mehta, R. Malach, Hippocampal sharp-wave ripples linked to visu
URL https://www.sciencemag.org/lookup/doi/10.1126/science.aax1030
Y. Norman, O. Raccah, S. Liu, J. Parvizi, R. Malach, Hippocampal ripples and their coordinated dialogue with the defa
URL https://www.cell.com/neuron/abstract/S0896-6273(21)00461-X
C. J. Behrens, L. P. van den Boom, L. de Hoz, A. Friedman, U. Heinemann, Induction of sharp waveripple complexes in
URL https://www.nature.com/articles/nn1571
H. Norimoto, K. Makino, M. Gao, Y. Shikano, K. Okamoto, T. Ishikawa, T. Sasaki, H. Hioki, S. Fujisawa, Y. Ikegaya, H
J. O'Keefe, J. Dostrovsky, The hippocampus as a spatial map: Preliminary evidence from unit activity in the freely-mov
J. O'Keefe, Place units in the hippocampus of the freely moving rat, Experimental Neurology 51 (1) (1976) 78–109. doi
URL https://www.sciencedirect.com/science/article/pii/0014488676900558
A. D. Ekstrom, M. J. Kahana, J. B. Caplan, T. A. Fields, E. A. Isham, E. L. Newman, I. Fried, Cellular networks unde
URL https://www.nature.com/articles/nature01964
K. B. Kjelstrup, T. Solstad, V. H. Brun, T. Hafting, S. Leutgeb, M. P. Witter, E. I. Moser, M.-B. Moser, Finite Scale o
URL https://www.science.org/doi/abs/10.1126/science.1157086
C. D. Harvey, F. Collman, D. A. Dombeck, D. W. Tank, Intracellular dynamics of hippocampal place cells during virtua
URL https://www.nature.com/articles/nature08499
H. Zhang, P. D. Rich, A. K. Lee, T. O. Sharpee, Hippocampal spatial representations exhibit a hyperbolic geometry tha
URL https://www.nature.com/articles/s41593-022-01212-4
P. A. Naber, F. H. Lopes da Silva, M. P. Witter, Reciprocal connections between the entorhinal cortex and hippocampa
URL https://onlinelibrary.wiley.com/doi/abs/10.1002/hipo.1028
N. M. van Strien, N. L. M. Cappaert, M. P. Witter, The anatomy of memory: an interactive overview of the parahippoc
URL https://www.nature.com/articles/nrn2614
B. A. Strange, M. P. Witter, E. S. Lein, E. I. Moser, Functional organization of the hippocampal longitudinal axis, Natu
URL https://www.nature.com/articles/nrn3785
R. J. Gardner, E. Hermansen, M. Pachitariu, Y. Burak, N. A. Baas, B. A. Dunn, M.-B. Moser, E. I. Moser, Toroidal to
URL https://www.nature.com/articles/s41586-021-04268-7
Y. Watanabe, M. Okada, Y. Ikegaya, Towards threshold invariance in defining hippocampal ripples, Journal of Neural E
URL https://dx.doi.org/10.1088/1741-2552/ac3266
E. Boran, T. Fedele, A. Steiner, P. Hilfiker, L. Stieglitz, T. Grunwald, J. Sarnthein, Dataset of human medial temporal
URL https://www.nature.com/articles/s41597-020-0364-3
B. M. Yu, J. P. Cunningham, G. Santhanam, S. I. Ryu, K. V. Shenoy, M. Sahani, Gaussian-Process Factor Analysis for
URL https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2712272/
J. Niediek, J. Bostrm, C. E. Elger, F. Mormann, Reliable Analysis of Single-Unit Recordings from the Human Brain un
URL https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0166598
A. A. Liu, S. Henin, S. Abbaspoor, A. Bragin, E. A. Buffalo, J. S. Farrell, D. J. Foster, L. M. Frank, T. Gedankien, J. G
URL https://www.nature.com/articles/s41467-022-33536-x
K. Kay, M. Sosa, J. E. Chung, M. P. Karlsson, M. C. Larkin, L. M. Frank, A hippocampal network for spatial coding d
L. McInnes, J. Healy, N. Saul, L. Groberger, UMAP: Uniform Manifold Approximation and Projection, Journal of Ope
URL https://joss.theoj.org/papers/10.21105/joss.00861
P. J. Rousseeuw, Silhouettes: A graphical aid to the interpretation and validation of cluster analysis, Journal of Comput
URL https://www.sciencedirect.com/science/article/pii/0377042787901257
P. Virtanen, R. Gommers, T. E. Oliphant, M. Haberland, T. Reddy, D. Cournapeau, E. Burovski, P. Peterson, W. Weck
URL https://ui.adsabs.harvard.edu/abs/2020NatMe..17..261V
G. Buzski, Two-stage model of memory trace formation: a role for "noisy" brain states, Neuroscience 31 (3) (1989) 551-
M. L. V. Quyen, A. Bragin, R. Staba, B. Crpon, C. L. Wilson, J. Engel, Cell Type-Specific Firing during Ripple Oscilla
URL https://www.jneurosci.org/content/28/24/6104
S. Royer, B. V. Zemelman, A. Losonczy, J. Kim, F. Chance, J. C. Magee, G. Buzski, Control of timing, rate and bursts

*Tables [1]Tablestables [2]ID 01id$_0$1[$htbp$]

Subject ID	**# of sessions**	**AHL**	**AHR**	**PHL**	**PHR**	**ECL**	**ECR**	**AL**	**AR**
1	4	n.a.				n.a.	n.a.		
lightgray 2	7								
3	3						n.a.		
lightgray 4	2								AHL
5	3	n.a.	n.a.		n.a.	n.a.	n.a.		
lightgray 6	6								AHI
7	4								
lightgray 8	5								
9	2								

This figure denotes the placements of electrodes and seizure onset zones. Regions marked with were included in the

The silhouette scores (mean ±SD across sessions per subject) for UMAP clustering of SWR^+ candidates and SWI

The table provides statistics of presumptive CA1 regions and SWR events. Only the initial two sessions (sessions 1

*Figures [1]Figuresfigures

[ht] [2]ID 01figure$_i d_0 1[width = 1]./src/figures/.png/Figure_I D_0 1.png$ **Local Field Potentials, Multiunit Activ**

A. Representative wideband LFP signals for intracranial EEG recording from the left hippocampal head are presen

[ht] [2]ID 02figure$_i d_0 2[width = 0.5]./src/figures/.png/Figure_I D_0 2.png$ **State-Dependent Neural Trajectory c**
A. Neural trajectories (NTs) depicted as a point cloud within the first three-dimensional factors derived from GPF

[ht] [2]ID 03figure$_i d_0 3[width = 1]./src/figures/.png/Figure_I D_0 3.png$ **Positive Correlation between Memory**
A. The relationship between set size (number of letters to be encoded) and accuracy in the working memory task (

[ht] [2]ID 04figure$_i d_0 4[width = 1]./src/figures/.png/Figure_I D_0 4.png$**Detection of SWRs in Putative CA1 R**
A. Two-dimensional UMAP [0] projection displays multi-unit spikes during SWR$^+$ candidates (*purple*) and SWR$^-$

[ht] [2]ID 05figure$_i d_0 5[width = 1]./src/figures/.png/Figure_I D_0 5.png$**Transient Change in Neural Trajectory**
A. The distance from origin (O) of the peri-sharp-wave-ripple neural trajectory (mean $\pm$95% confidence interval).

[ht] [2]ID 06figure$_i d_0 6[width = 1]./src/figures/.png/Figure_I D_0 6.png$ **Visualization of Neural Trajectory Du**
The panels depict hippocampal neural trajectories (NTs) during SWR projected onto two-dimensional spaces. ***A.*** S

[ht] [2]ID 07figure$_i d_0 7[width = 0.5]./src/figures/.png/Figure_I D_0 7.png$ **Direction of Neural Trajectory Durin**
A*–*B The kernel density estimation distributions of $\overrightarrow{\mathrm{eSWR}^{+}} \cdot \overrightarrow{\mathrm{rSWR}^{+}}$ (*pink circles*), $\overrightarrow{\mathrm{eSWR}^{+}} \cdot \overrightarrow{\mathrm{g_{E}g_{R}}}$ (*blue triangles*