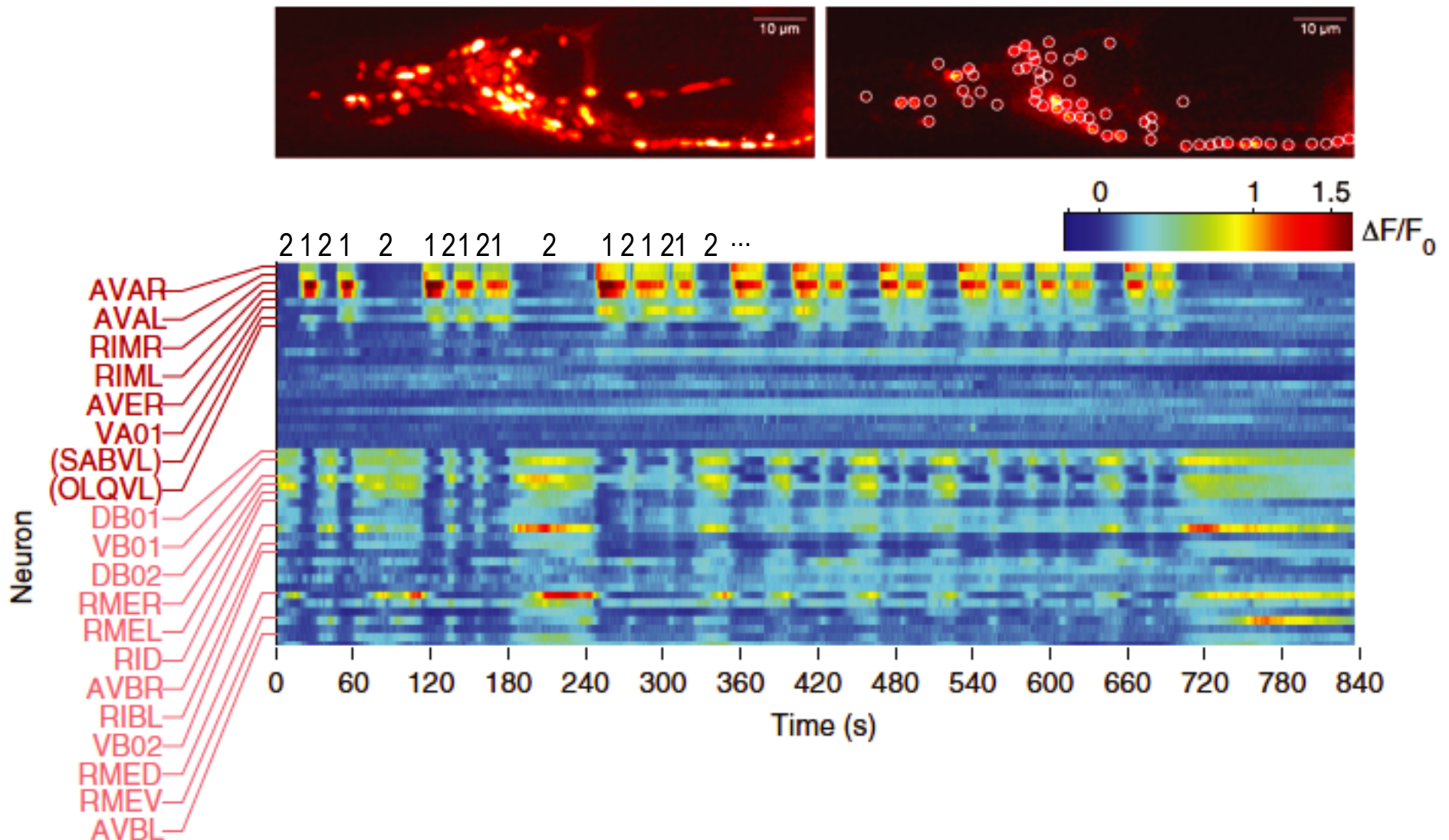# Global Brain Dynamics Embed the Motor Command Sequence of *Caenorhabditis elegans*
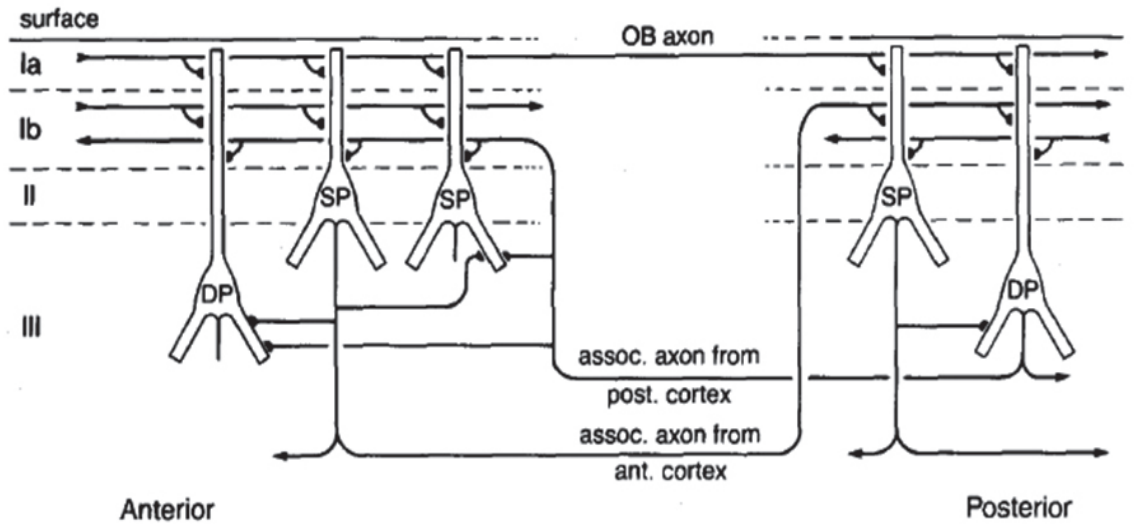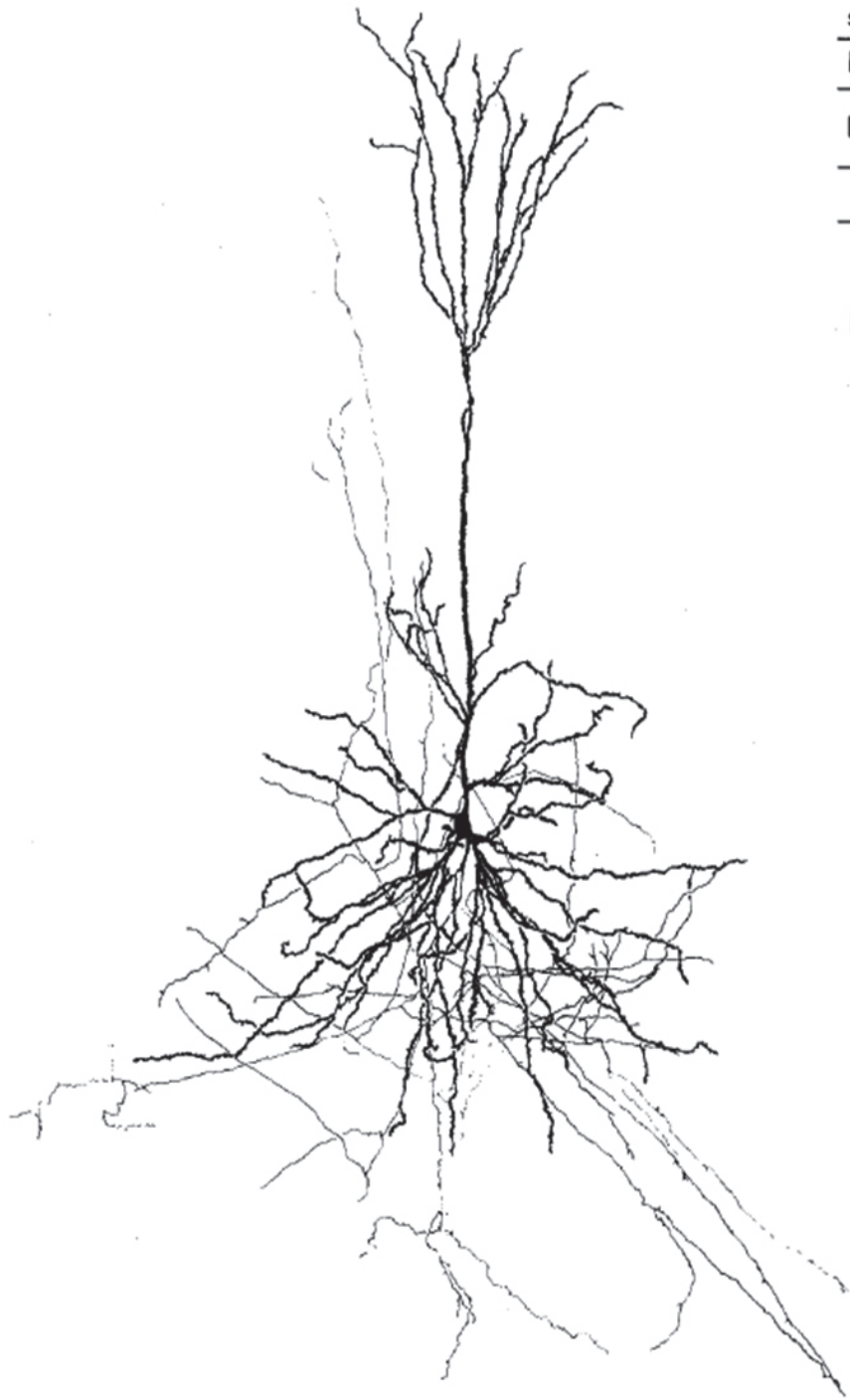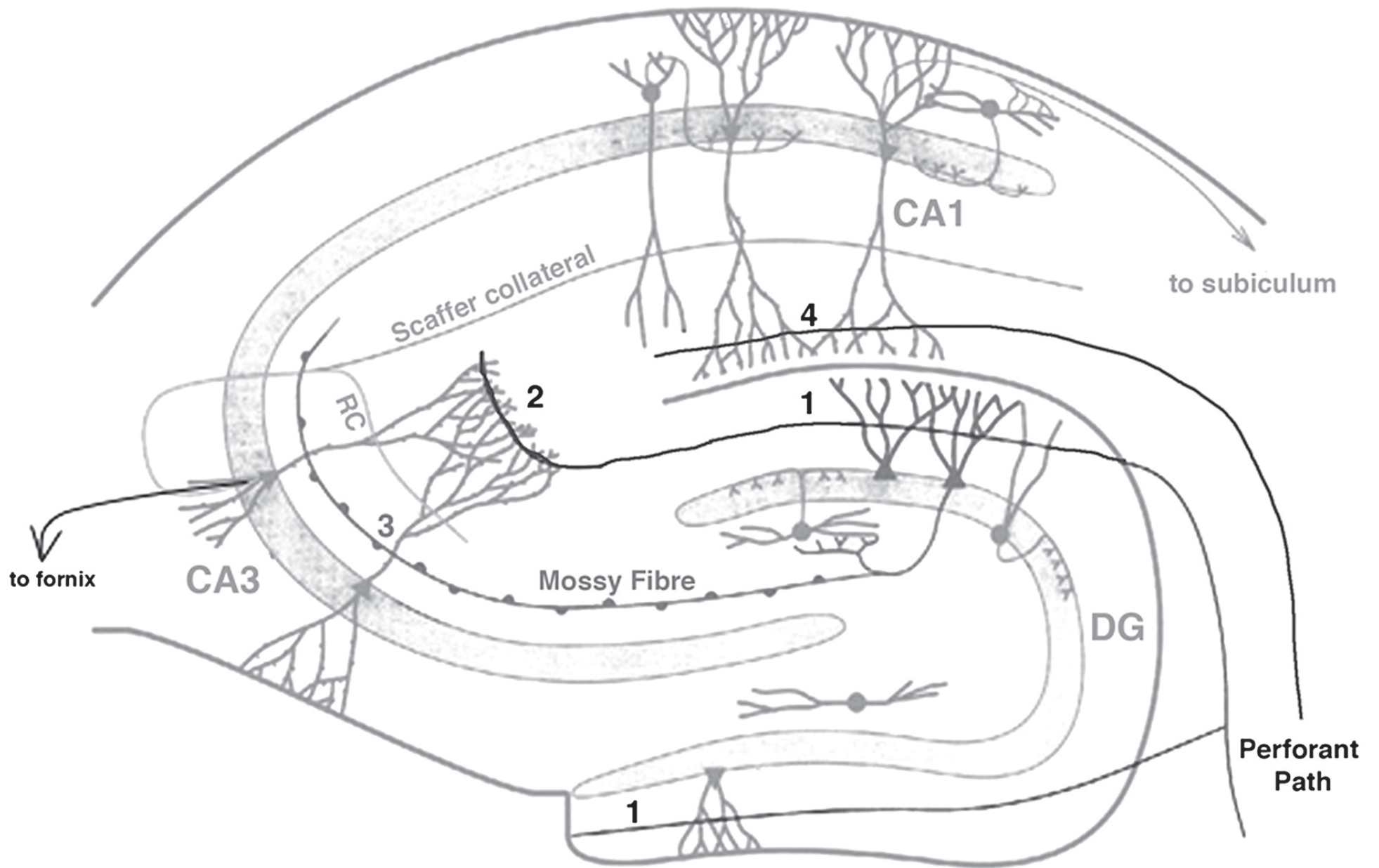
Saul Kato,[1,4] Harris S. Kaplan,[1,4] Tina Schrödel,[1,4] Susanne Skora,[1] Theodore H. Lindsay,[2,5] Eviatar Yemini,[3] Shawn Lockery,[2] and Manuel Zimmer[1,*]

surface ——————————————————— OB axon ———
Ia
Ib
II   SP   SP   SP
III   DP   DP
                    assoc. axon from
                    post. cortex
                    assoc. axon from
                    ant. cortex

Anterior   Posterior

CA1

to subiculum

Scaffer collateral

4

2

RC

1

3

to fornix

CA3

Mossy Fibre

DG

1

Perforant Path

Intracellular Determinants of Hippocampal CA1 Place and Silent Cell Activity in a Novel Environment

Jérôme Epsztein,[1,2,3,4] Michael Brecht,[1] and Albert K. Lee[1,5,*]
[1]Bernstein Center for Computational Neuroscience, Humboldt University, Berlin 10115, Germany
[2]Institut de Neurobiologie de la Méditerranée, Marseille 13273, France
[3]Institut National de la Santé et de la Recherche Médicale U901, Marseille 13273, France
[4]Université de la Méditerranée Aix-Marseille II, UMR S901, Marseille 13273, France
[5]Howard Hughes Medical Institute, Janelia Farm Research Campus, Ashburn, VA 20147, USA
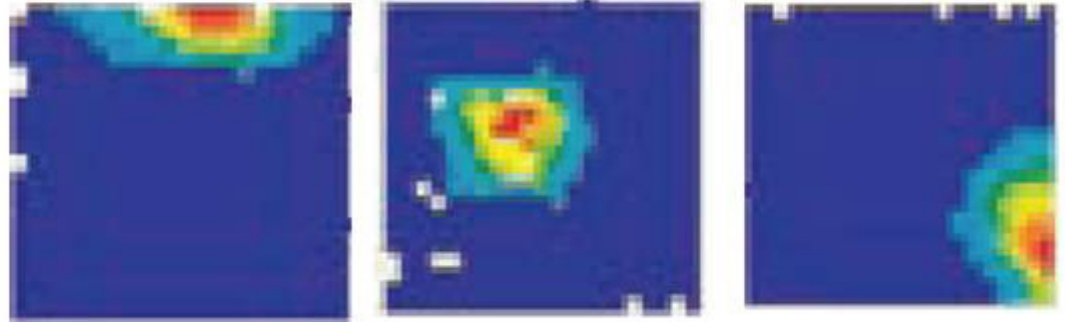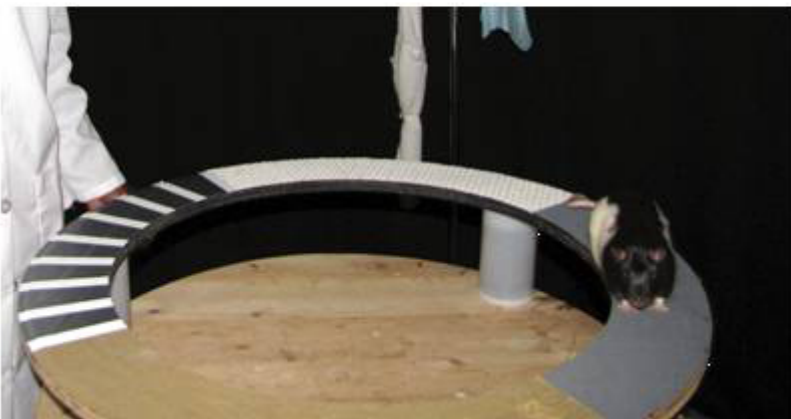*Correspondence: leea@janelia.hhmi.org
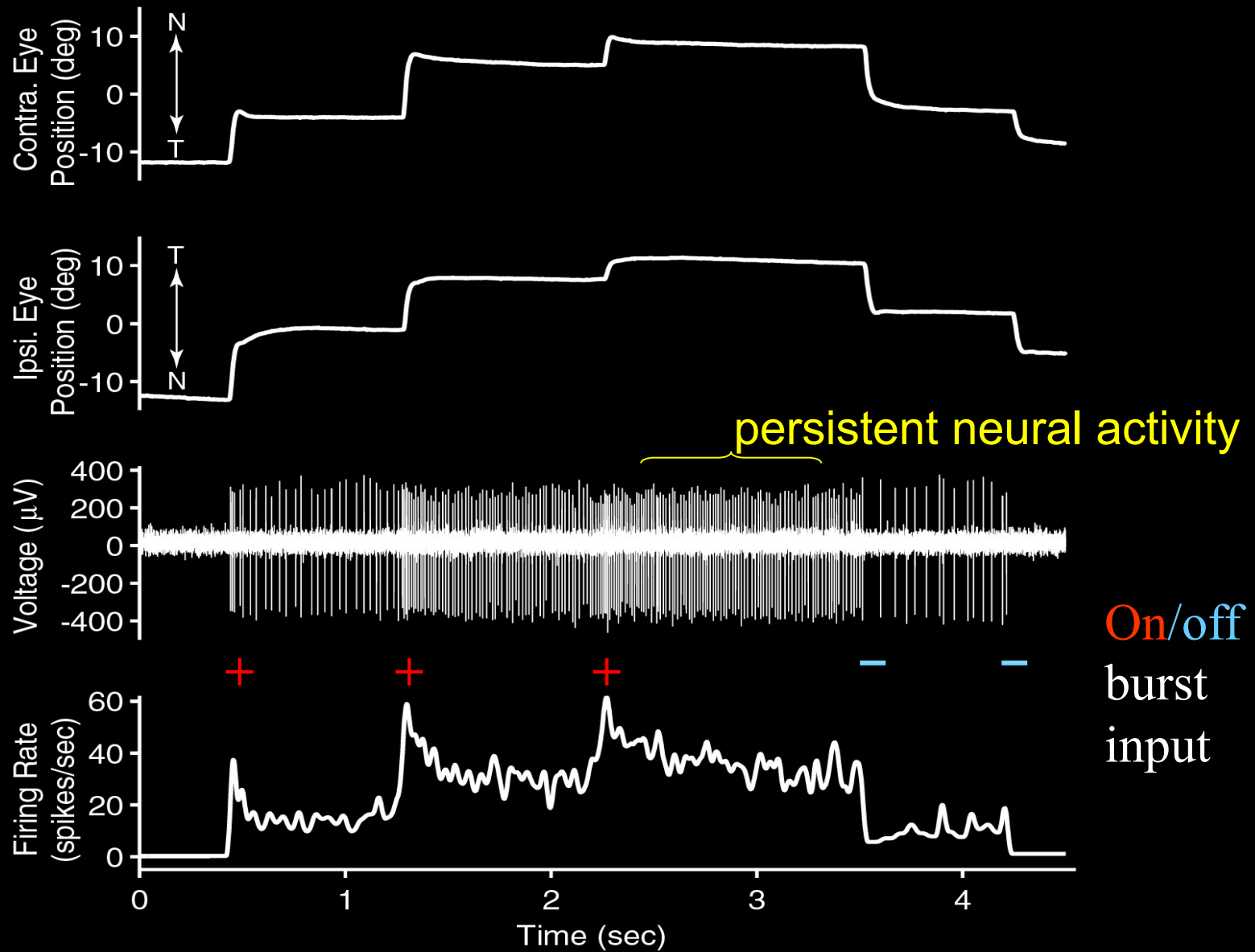DOI 10.1016/j.neuron.2011.03.006
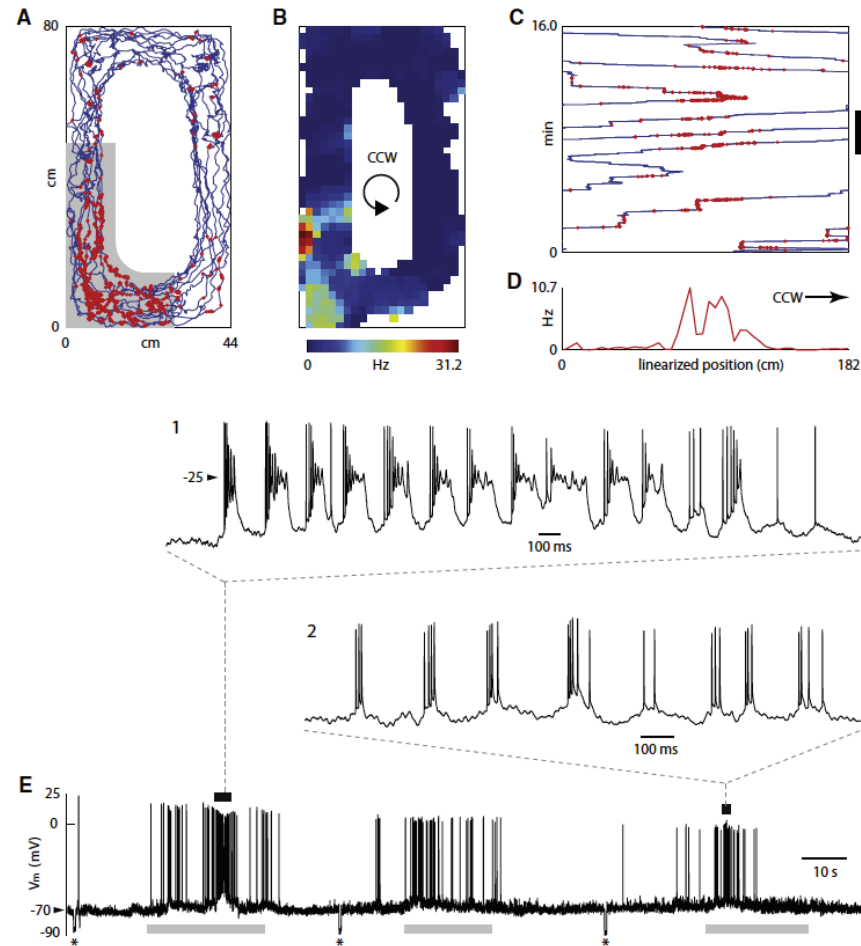
Box

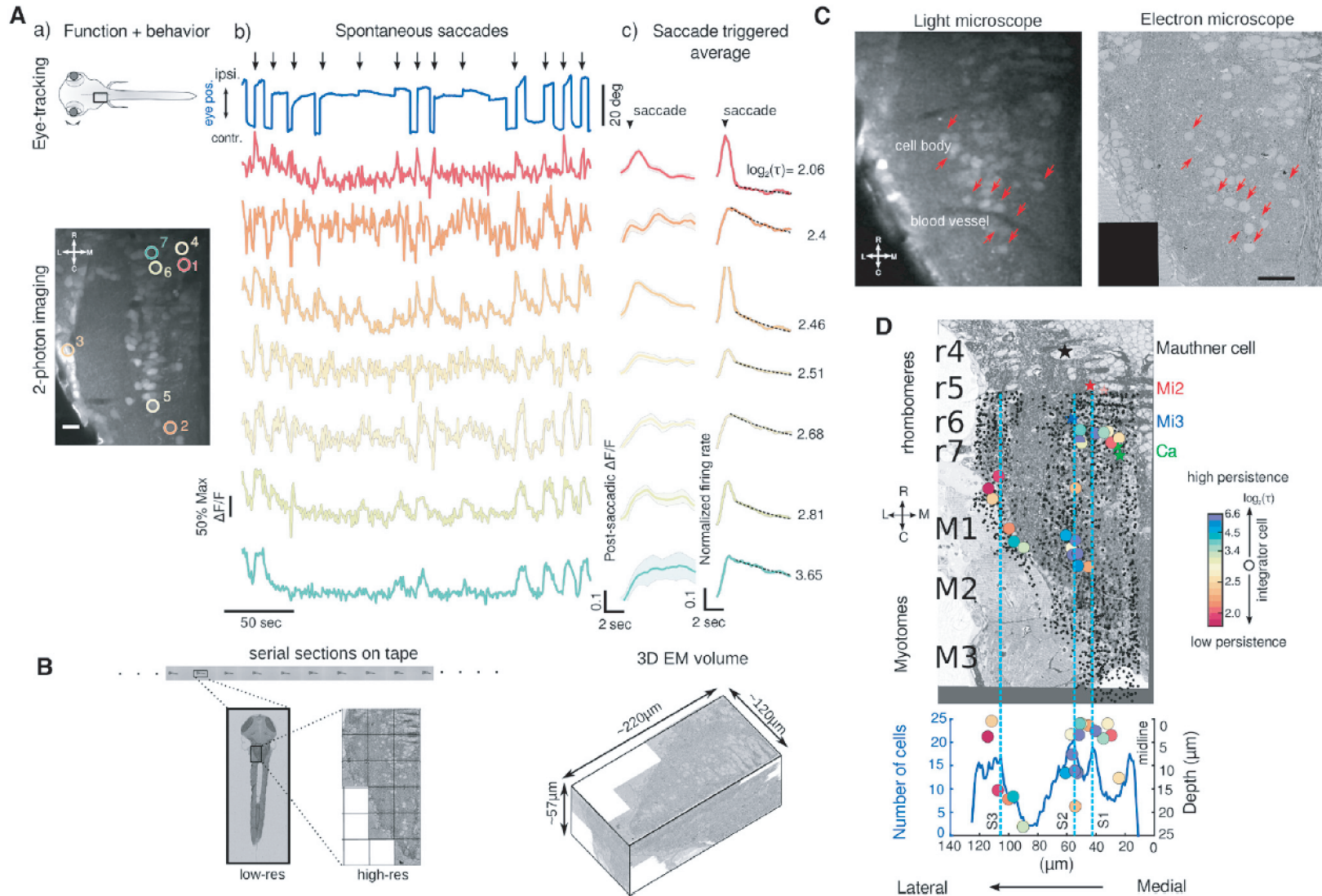# Hippocampal Place Fields

Circular Track

Neural Recording from the Oculomotor Integrator

Electron Microscopic Reconstruction of Functionally Identified Cells in a Neural Integrator

Ashwin Vishwanathan,[1,5,*] Kayvon Daie,[3] Alexandro D. Ramirez,[3] Jeff W. Lichtman,[4] Emre R.F. Aksay,[3] and H. Sebastian Seung[1,2,*]
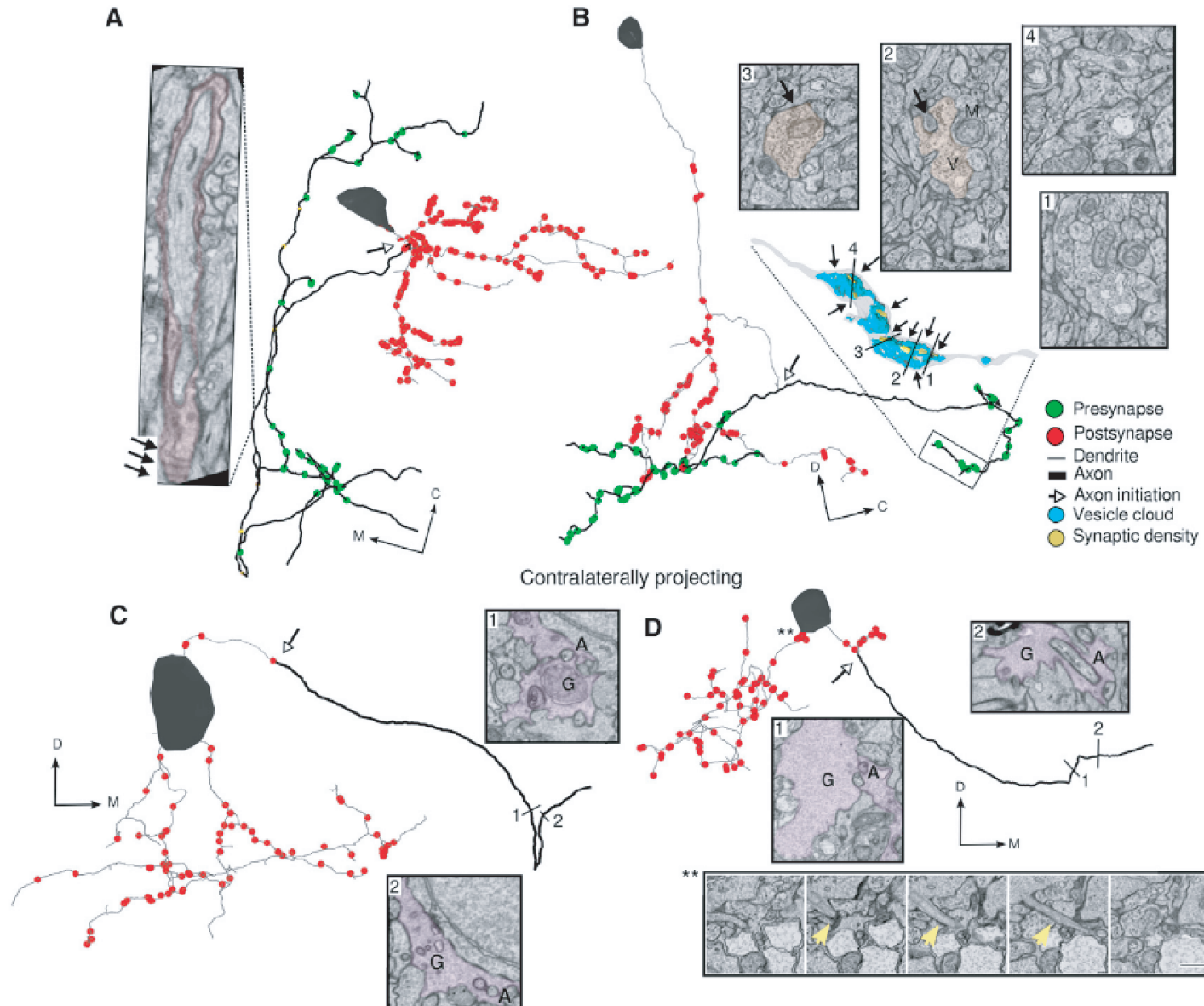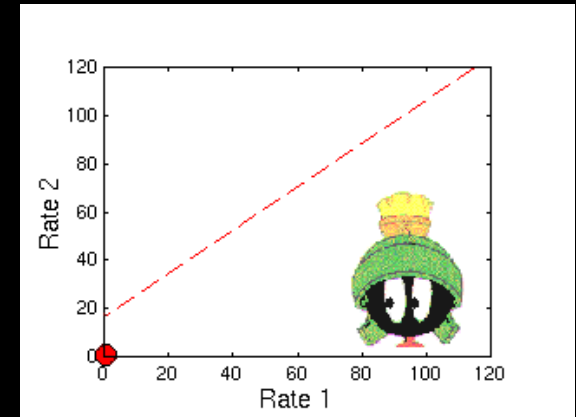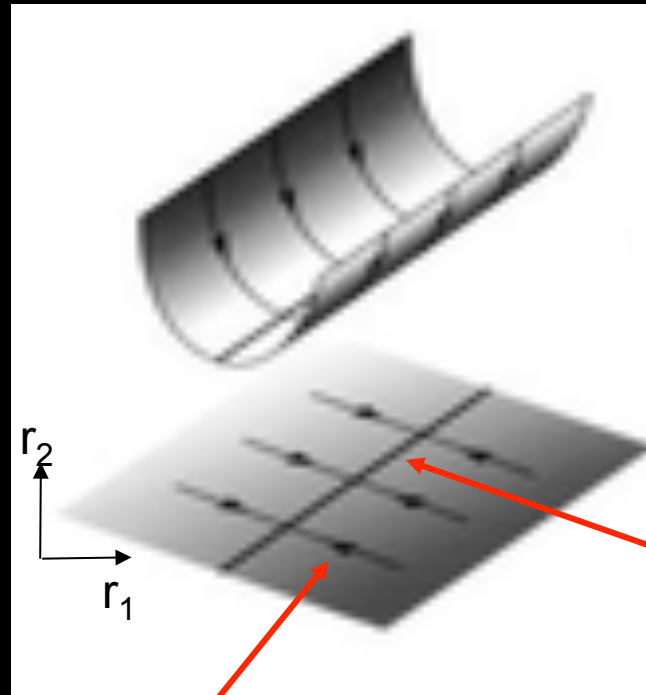
Electron Microscopic Reconstruction of Functionally Identified Cells in a Neural Integrator

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Presynapse
Postsynapse
Dendrite
Axon
Axon initiation
Vesicle cloud
Synaptic density

Contralaterally projecting

Line Attractor Picture of the Neural Integrator

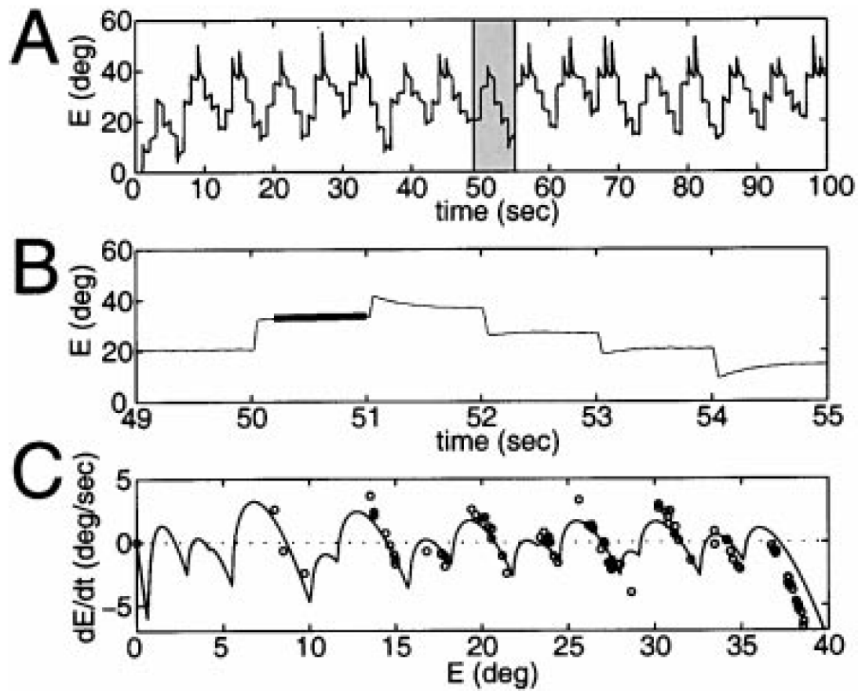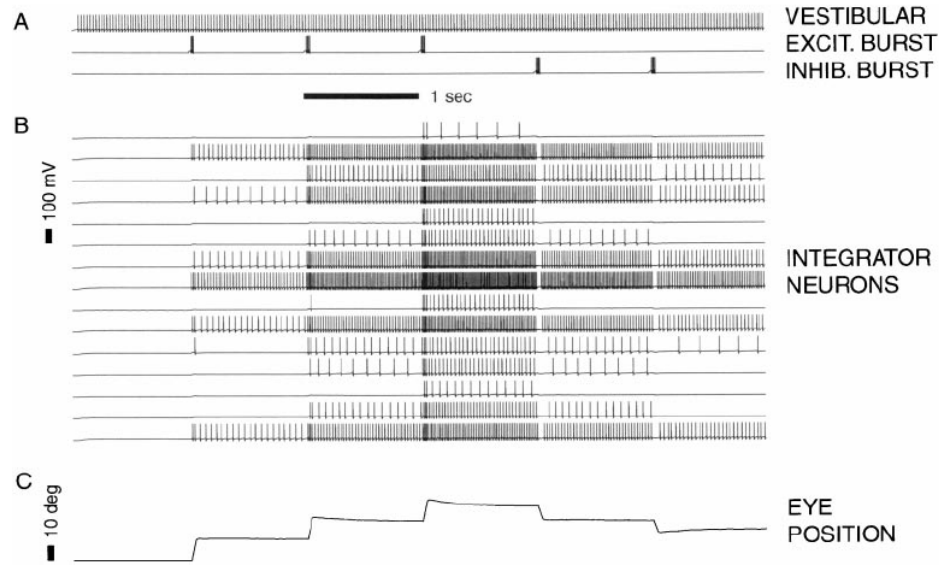Geometrical picture
of eigenvectors:

No decay along direction
of eigenvector with
eigenvalue = 1

Decay along direction of
eigenvectors with eigenvalue < 1

"Line Attractor" or "Line of Fixed Points"

Seung Integrator Model (15 neurons)

Death of a neuron!

a Control

R

Eye position

saccade

Firing

1/ISI — smoothed

time →

5 s

TC ~ 20 s

b Unstable

L

5 s

TC ~ 1 s

c Leaky

R

5 s

TC ~ 1 s