Technology of Neuroscience

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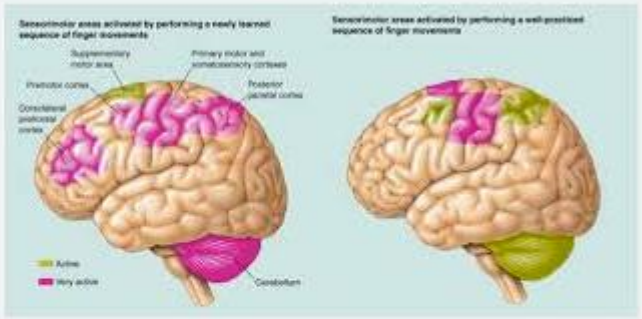
1. **Background**
2. **Study**
3. **Implications**

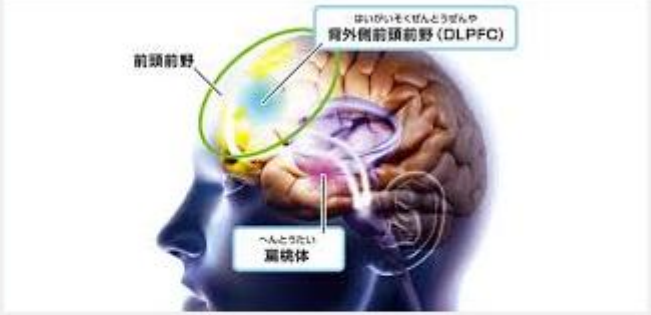

L.A. Cicero

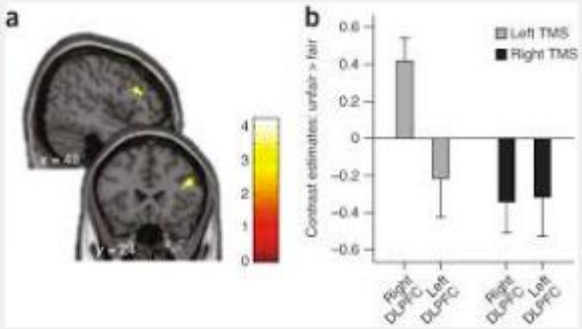
Imbalance between Left and Right Dorsolateral Prefrontal Cortex in Major Depression Is Linked to Negative Emotional Judgment: An fMRI Study in Severe Major Depressive Disorder

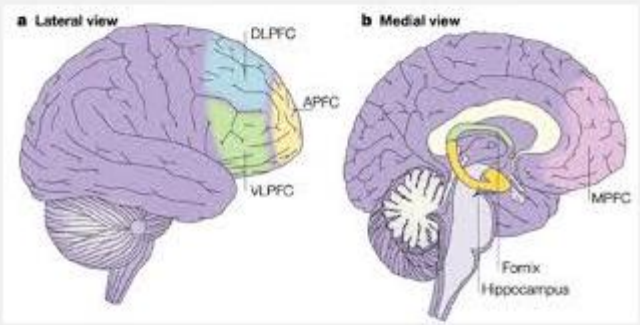
Simone Grimm, Johannes Beck, Daniel Schuepbach, Daniel Hell, Peter Boesiger, Felix Bermpohl, Ludwig Niehaus, Heinz Boeker, and Georg Northoff

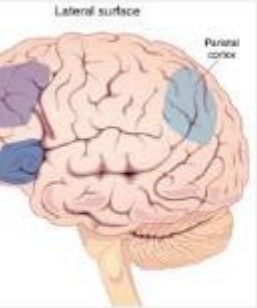
Dorso Lateral Pre-Frontal Cortex (DLPFC)

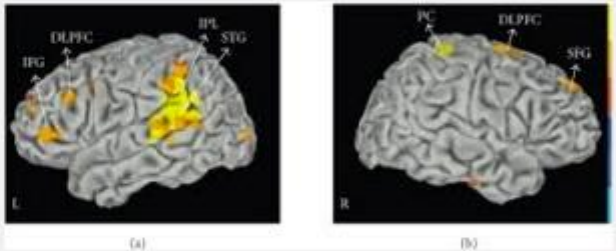


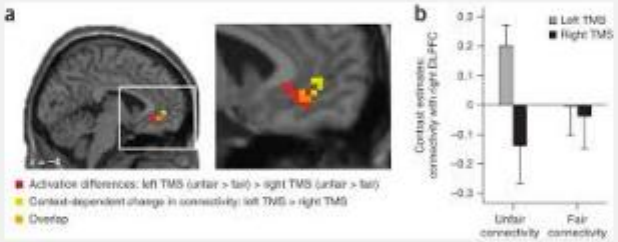


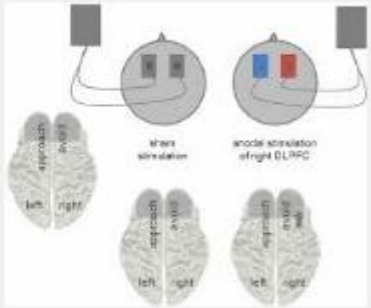


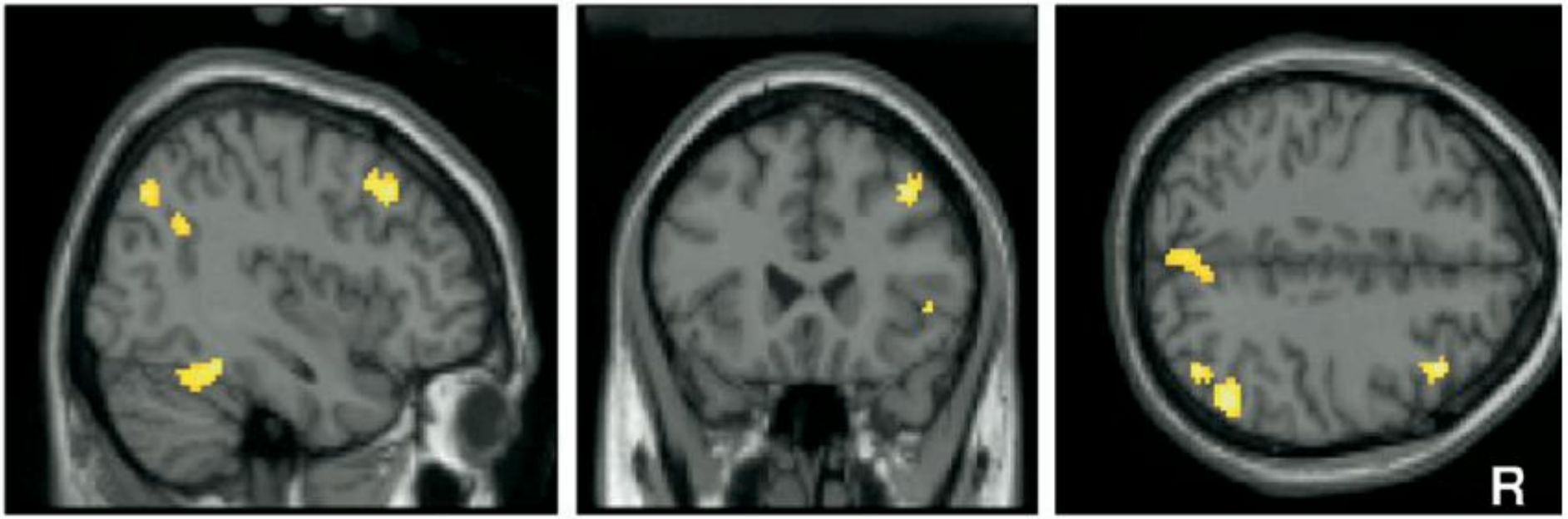




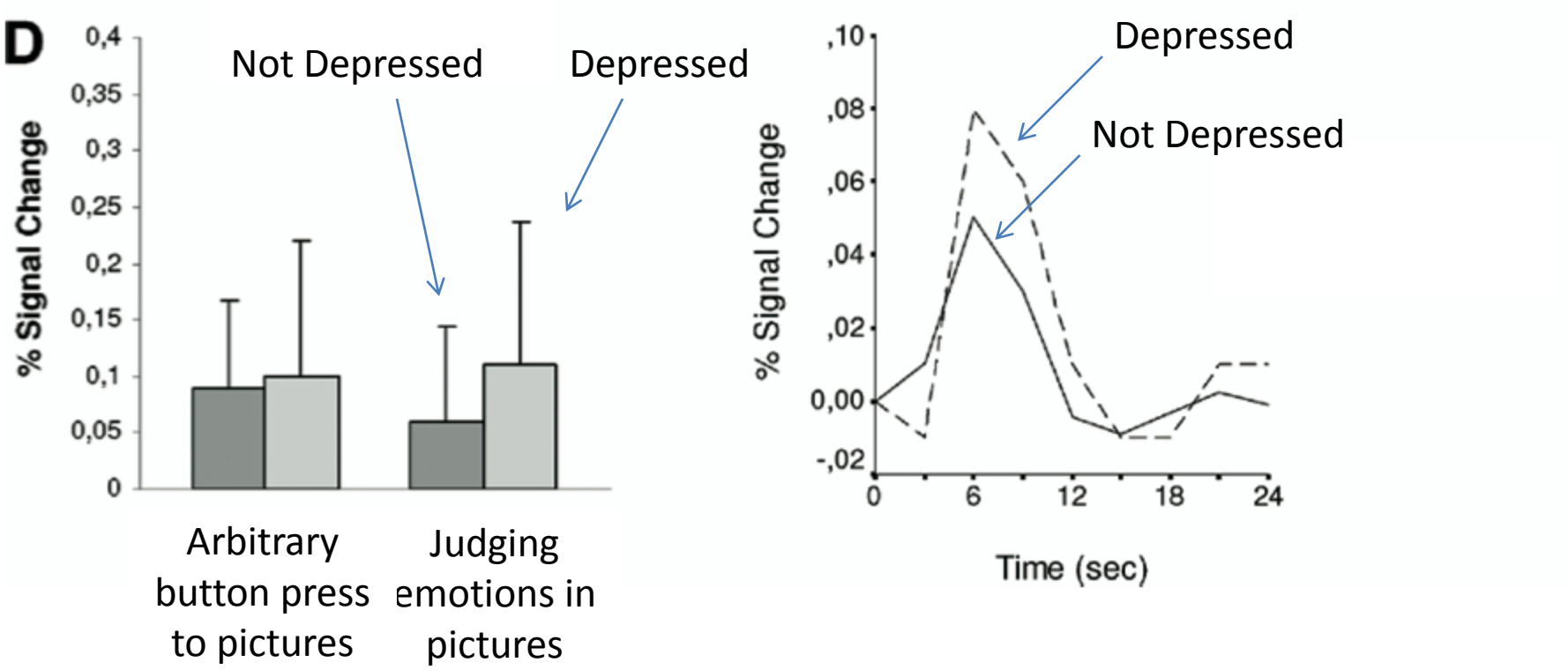








Grimm et al, 2007



Grimm et al, 2007

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LETTERS

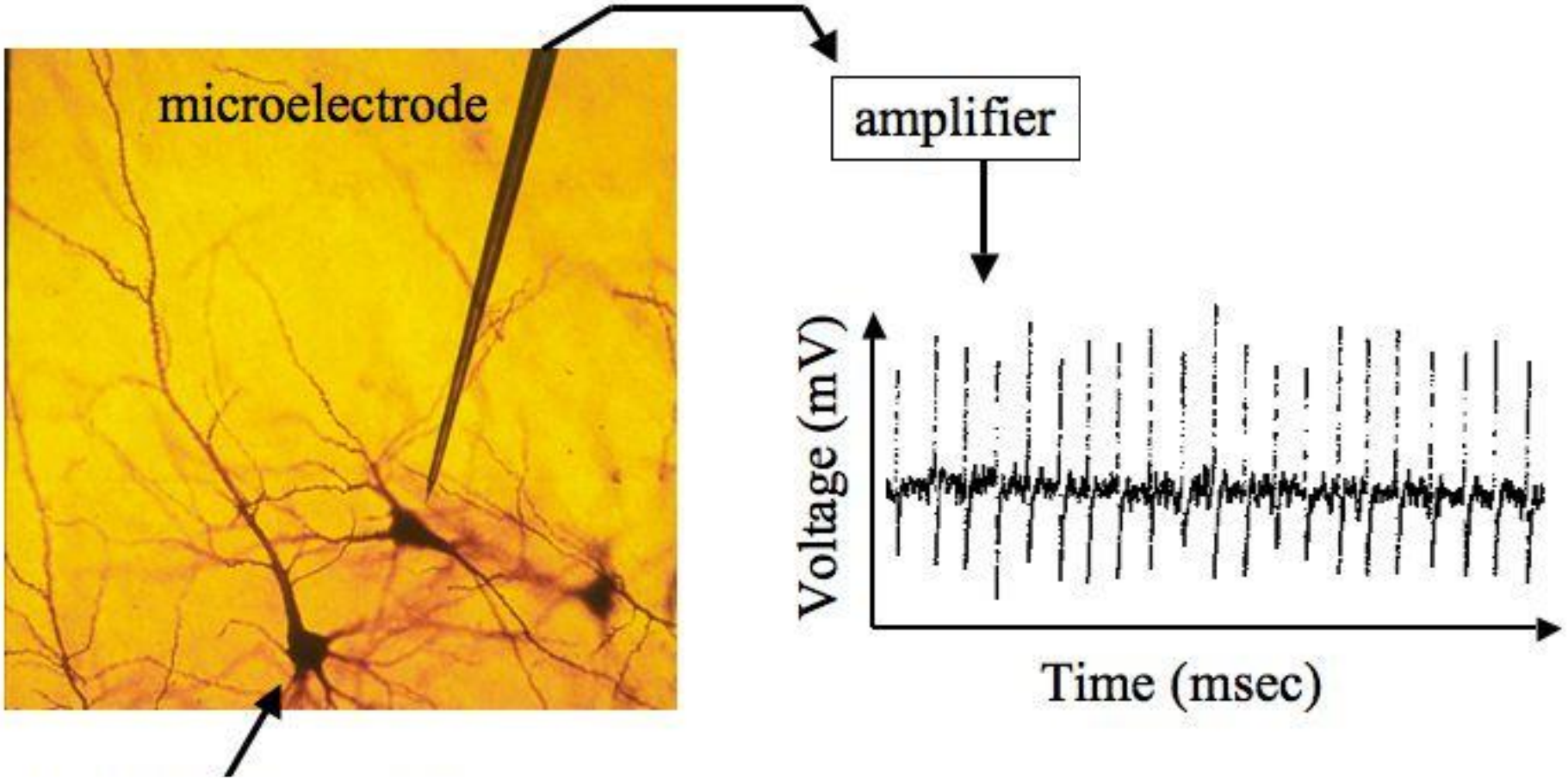
Cortical control of a prosthetic arm for self-feeding

Meel Velliste[1], Sagi Perel[2,3], M. Chance Spalding[2,3], Andrew S. Whitford[2,3] & Andrew B. Schwartz[1–6]

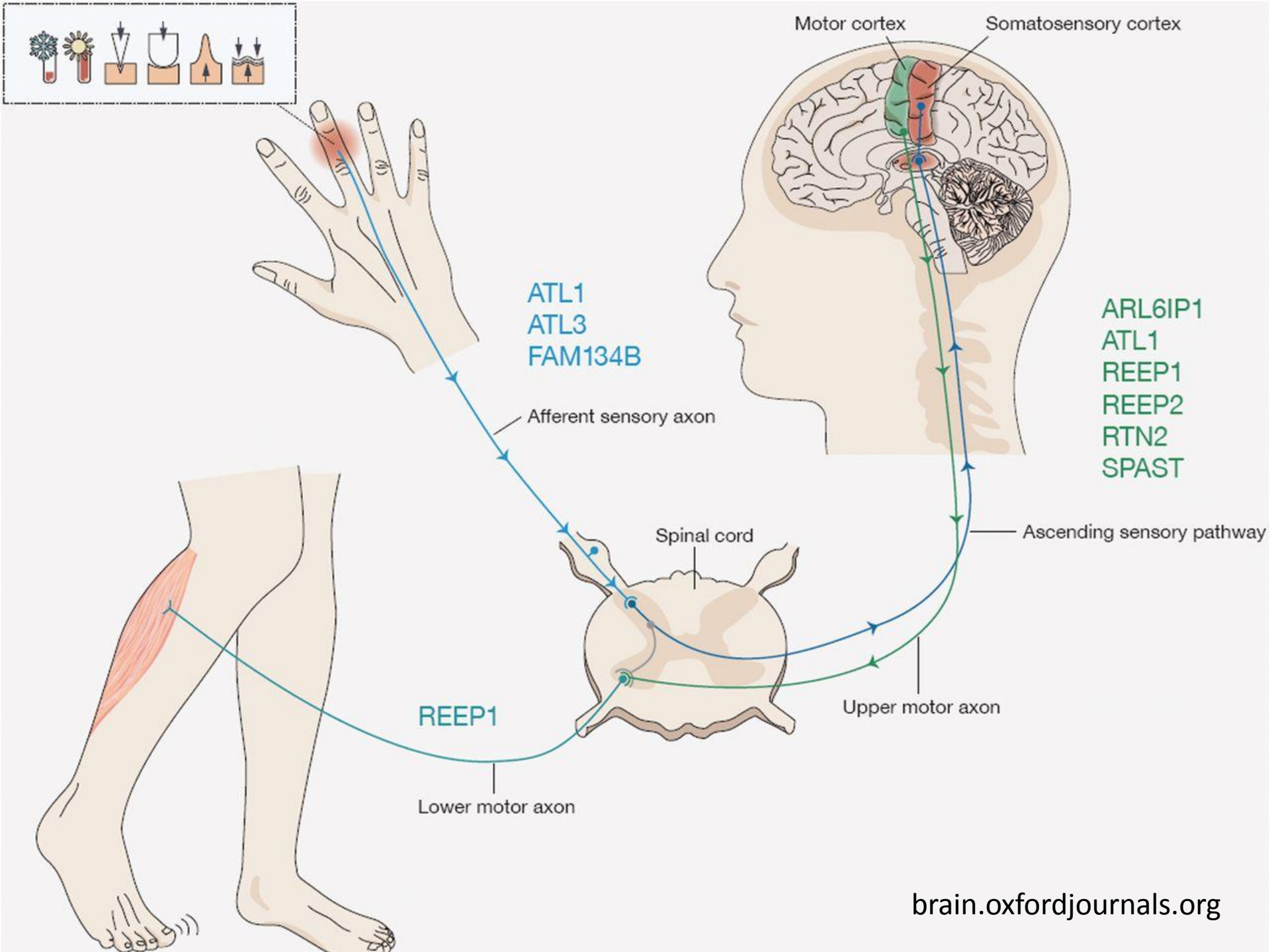
Arm movement is well represented in populations of neurons recorded from the motor cortex[1–7]. Cortical activity patterns have been used in the new field of brain–machine interfaces[8–11] to show

Many algorithms of varying complexity have been developed in open-loop[7,25–27] or closed-loop experiments[12–24], but here we show that a simple algorithm functioned well in this application. The

Schwartz et al



cns.nyu.edu/~david



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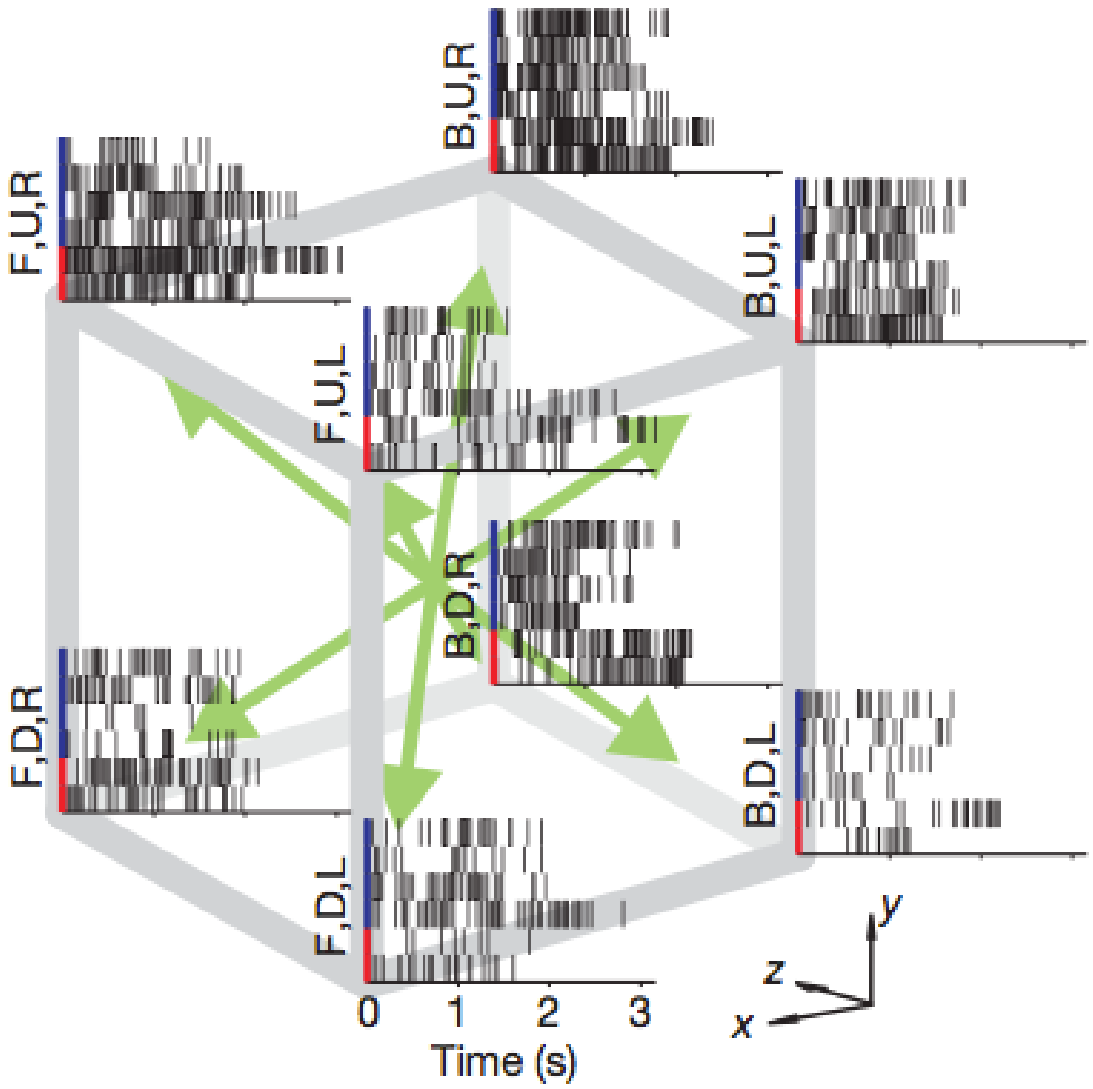
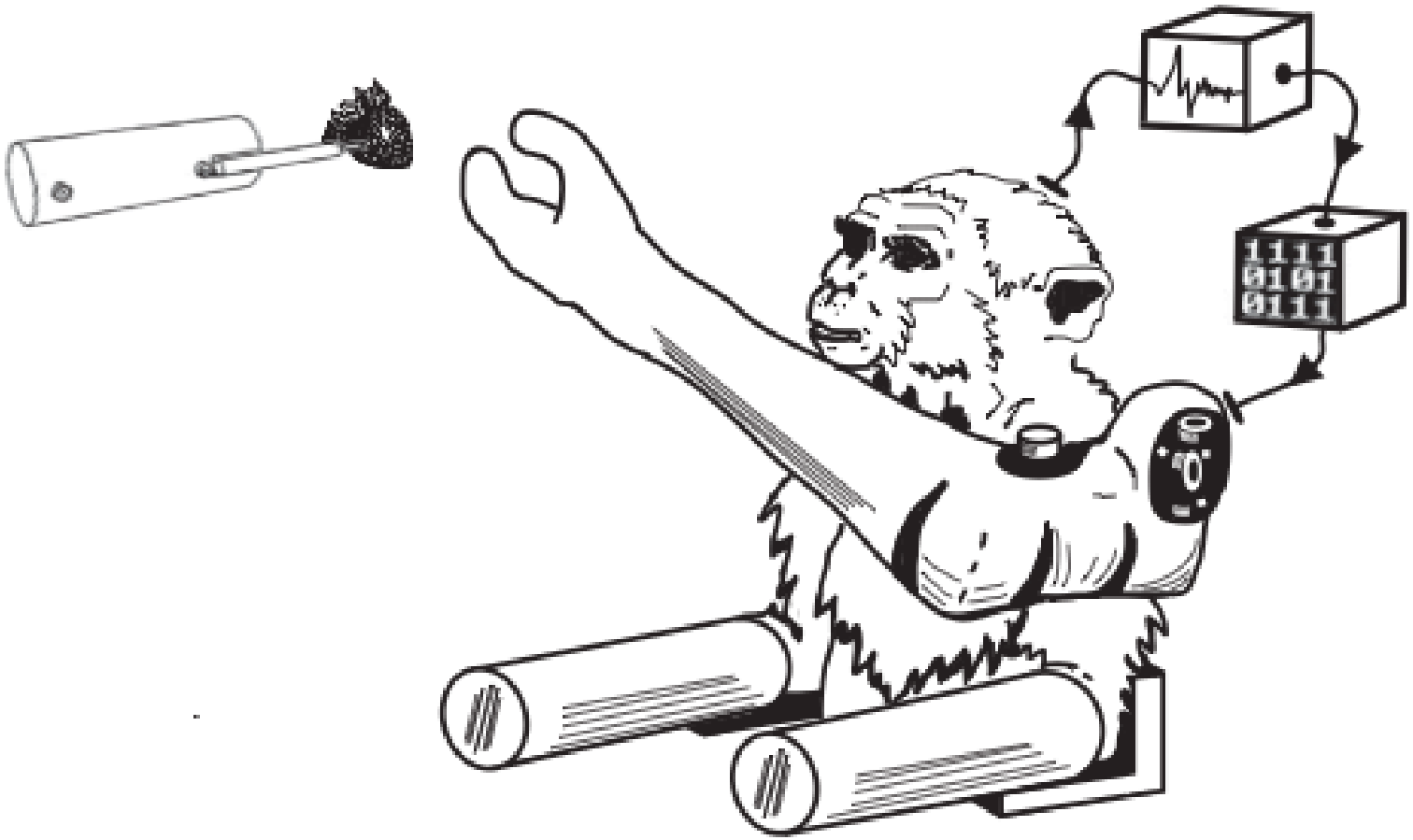


Velliste et al, 2008



Velliste et al, 2008

increases in expression of the
rker aP2, whereas 1 mM glu-
lower levels of aP2 gene ex-
C and D).
ation was regulated during dif-
nutrient-dependent manner, in-
g to both glucose and acetate
4E). Glucose-dependent regu-
acetylation was dependent on
upraphysiologic concentrations
sed histone acetylation in the
ce of ACL (Fig. 4H). Similarly,
Glut4 and the glycolytic genes
LDH-A were regulated accord-
ilability, in an ACL-dependent
These results demonstrate that,
differentiation, global histone
rmined by glucose availability
-dependent pathway and that
levels of acetate can also con-
.ceCS1. Our data also suggest
nsive histone acetylation may
e expression of genes required to
lular metabolism to use glucose
n and macromolecular synthesis.
nonstrated that ACL plays a
termining the total amount of
n in multiple mammalian cell

14. V. J. Staral, I. Cetic, R. W. Cole, J. D. Boeke, J. C. Escalante-Semerena, *Science* **298**, 2390 (2002).

1 August 2008; accepted 2 April 2009
10.1126/science.1164097

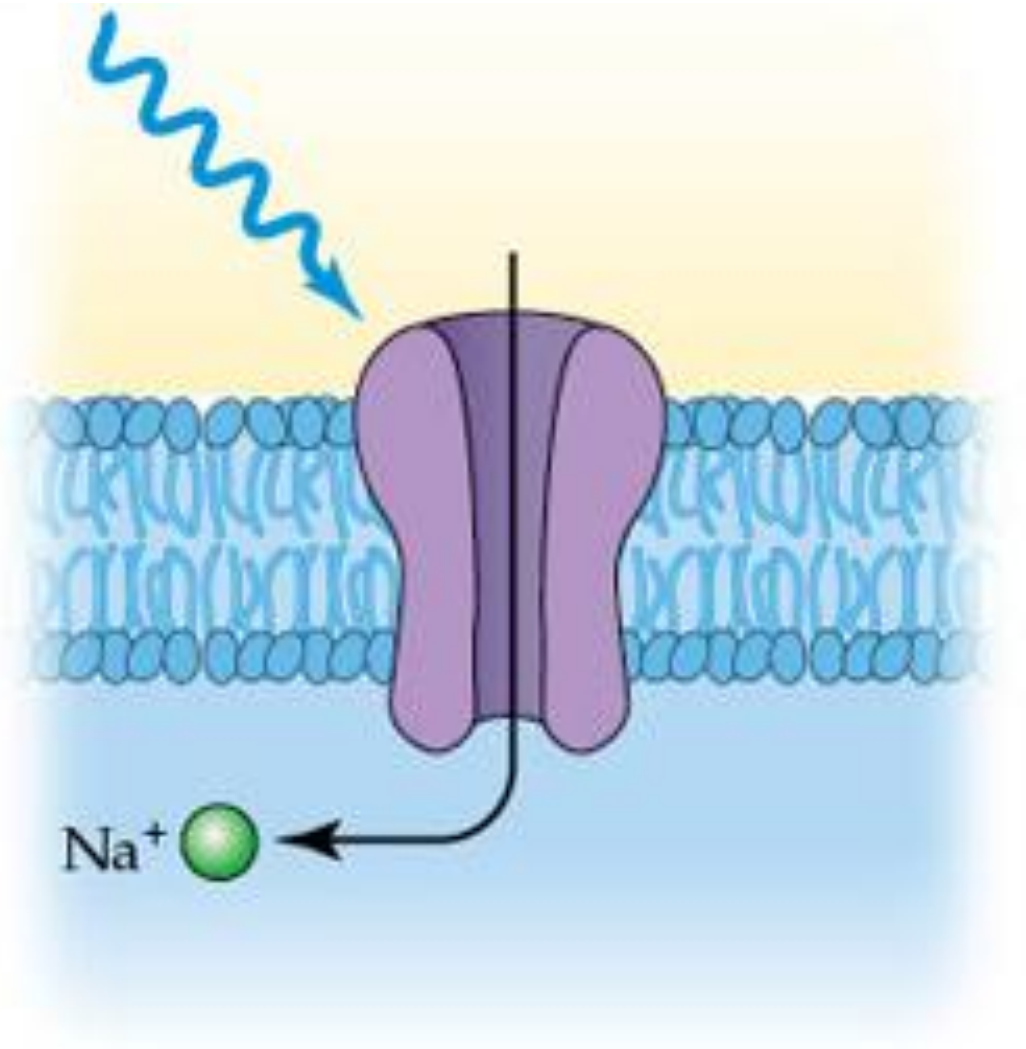
Phasic Firing in Dopaminergic Neurons Is Sufficient for Behavioral Conditioning

Hsing-Chen Tsai,[1,2]* Feng Zhang,[2]* Antoine Adamantidis,[3] Garret D. Stuber,[4] Antonello Bonci,[4] Luis de Lecea,[3] Karl Deisseroth[2,3]†

Natural rewards and drugs of abuse can alter dopamine signaling, and ventral tegmental area (VTA) dopaminergic neurons are known to fire action potentials tonically or phasically under different behavioral conditions. However, without technology to control specific neurons with appropriate temporal precision in freely behaving mammals, the causal role of these action potential patterns in driving behavioral changes has been unclear. We used optogenetic tools to selectively stimulate VTA dopaminergic neuron action potential firing in freely behaving mammals. We found that phasic activation of these neurons was sufficient to drive behavioral conditioning and elicited dopamine transients with magnitudes not achieved by longer, lower-frequency spiking. These results demonstrate that phasic dopaminergic activity is sufficient to mediate mammalian behavioral conditioning.

Dopaminergic (DA) neurons have been suggested to be involved in the cognitive and hedonic underpinnings of motivated behaviors (*1*–*4*). Changes in the firing pattern of DA neurons between low-frequency tonic activity and phasic bursts of action potentials could encode reward prediction errors and incentive salience (*5*). Consistent with the reward prediction-error hypothesis, DA neuron firing activity is depressed by aversive stimuli (*6*).

channel rhodopsin



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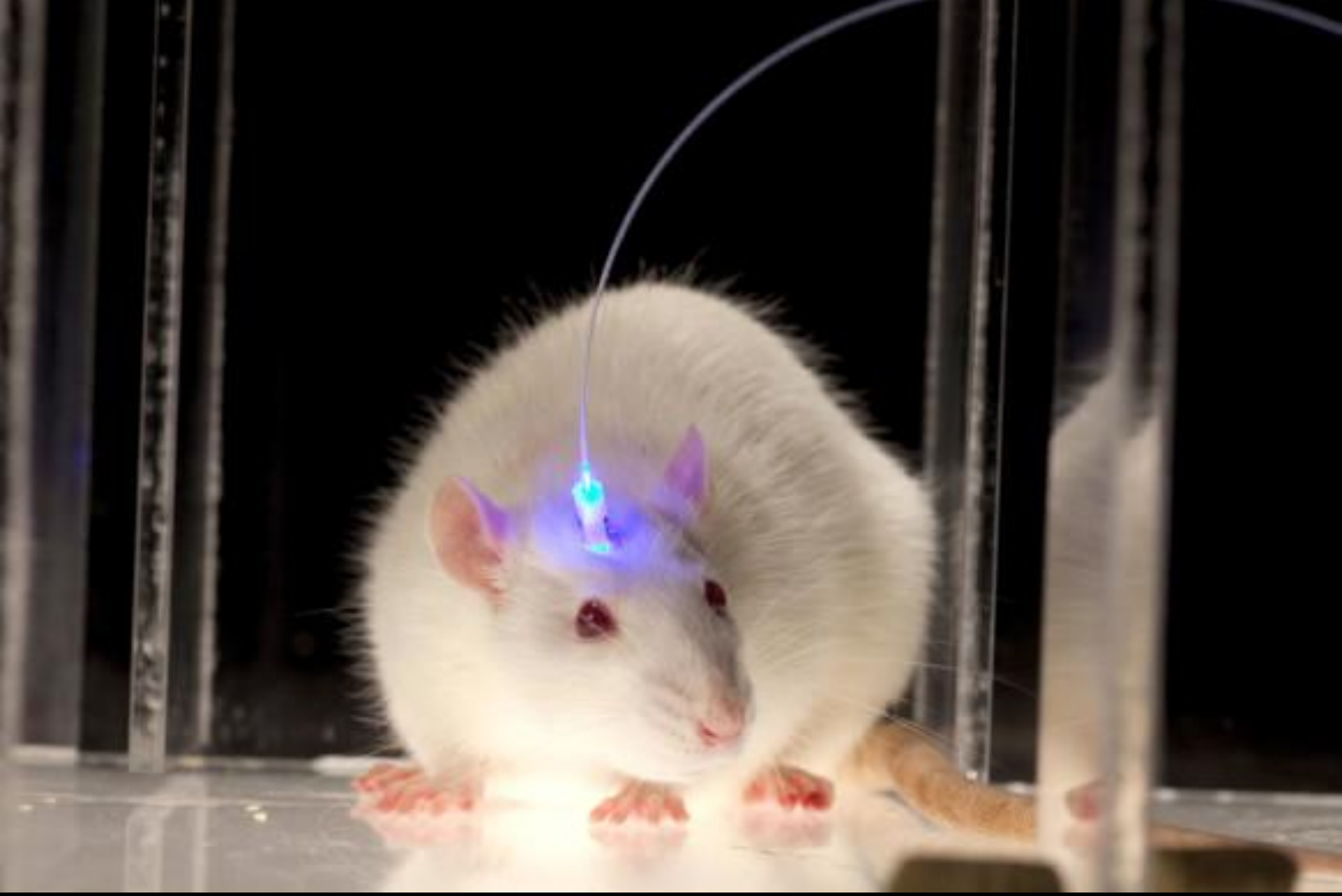
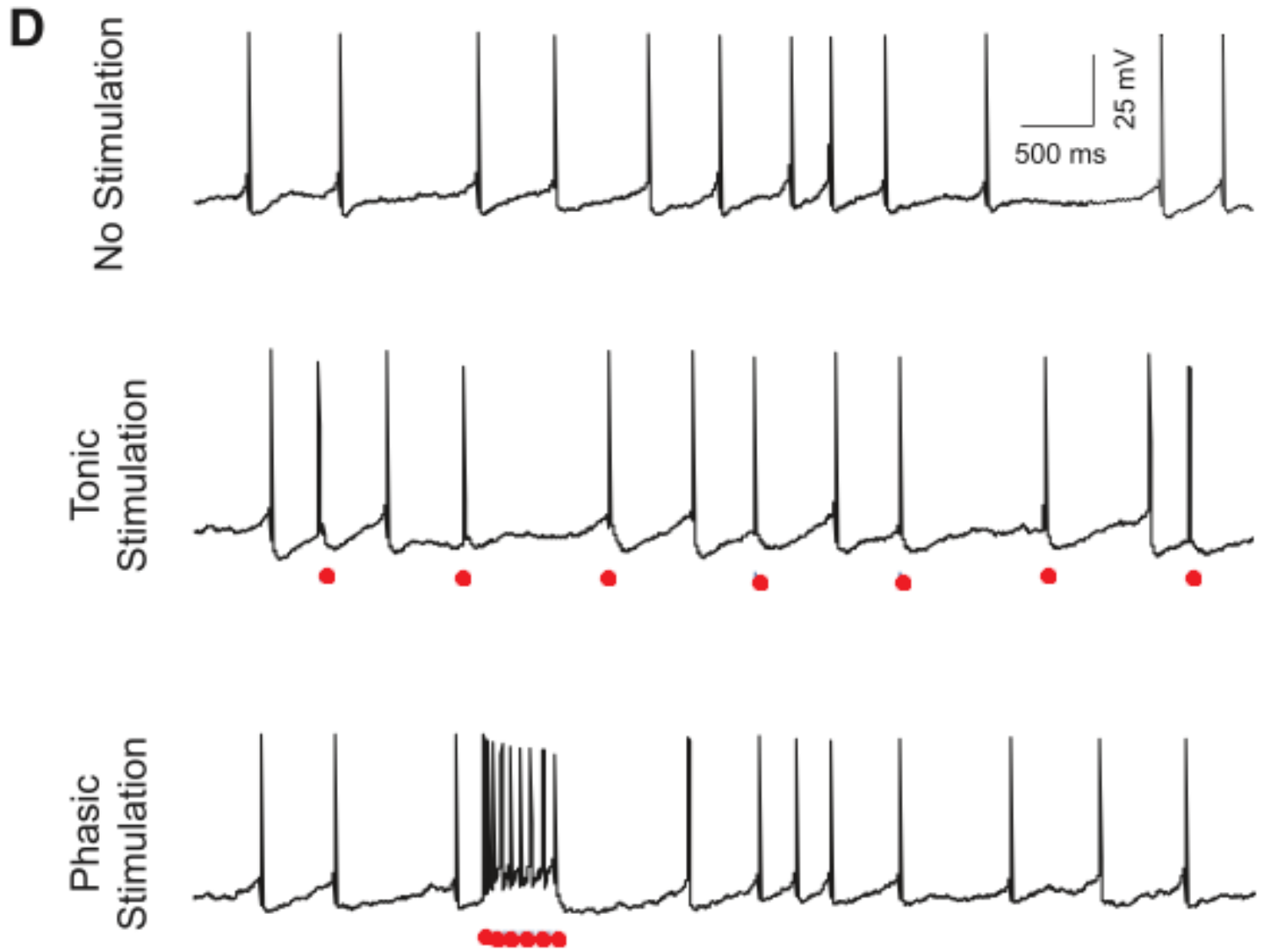
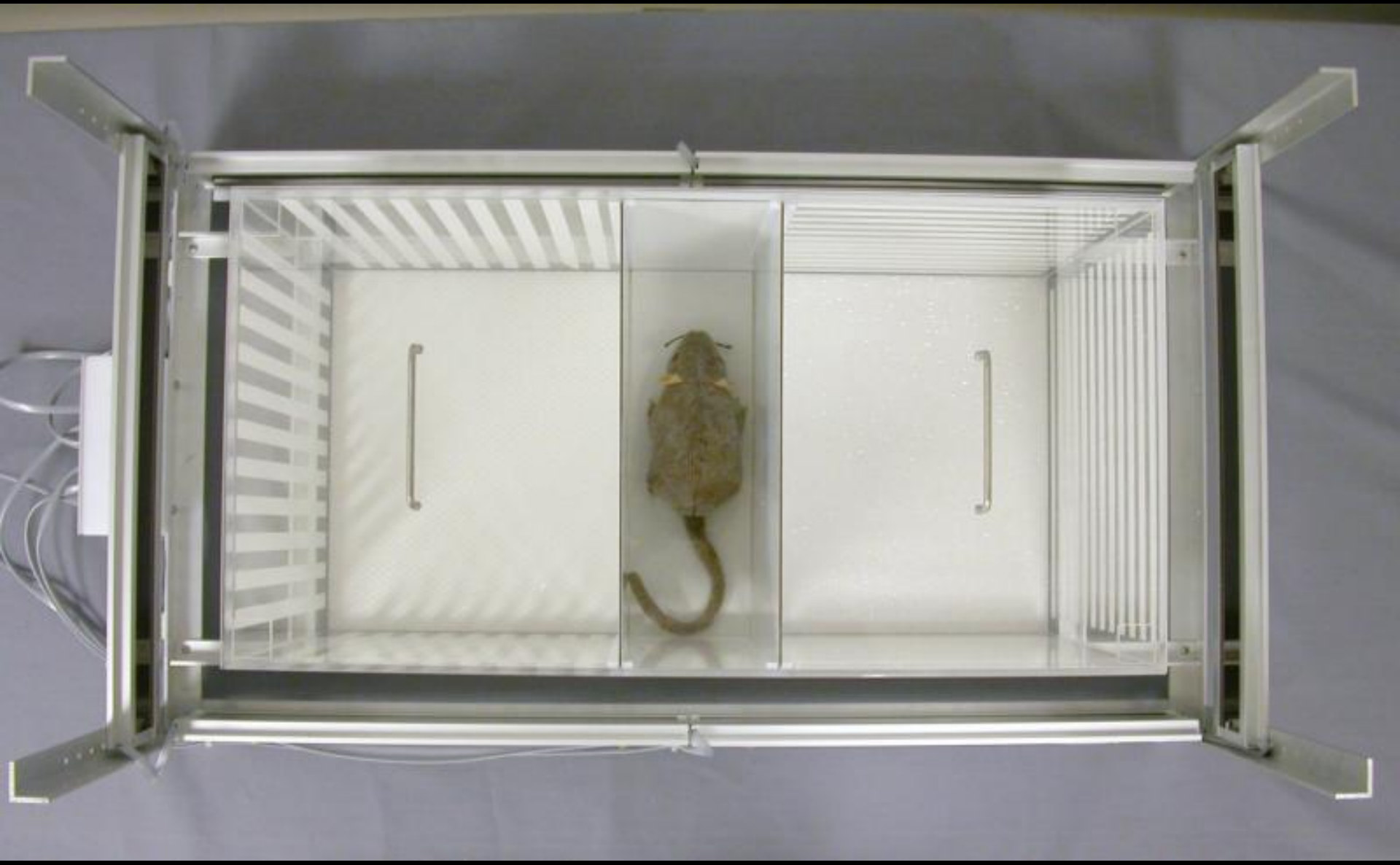


John B. Carnett/Popular Science via Getty Images



Tsai et al, 2009



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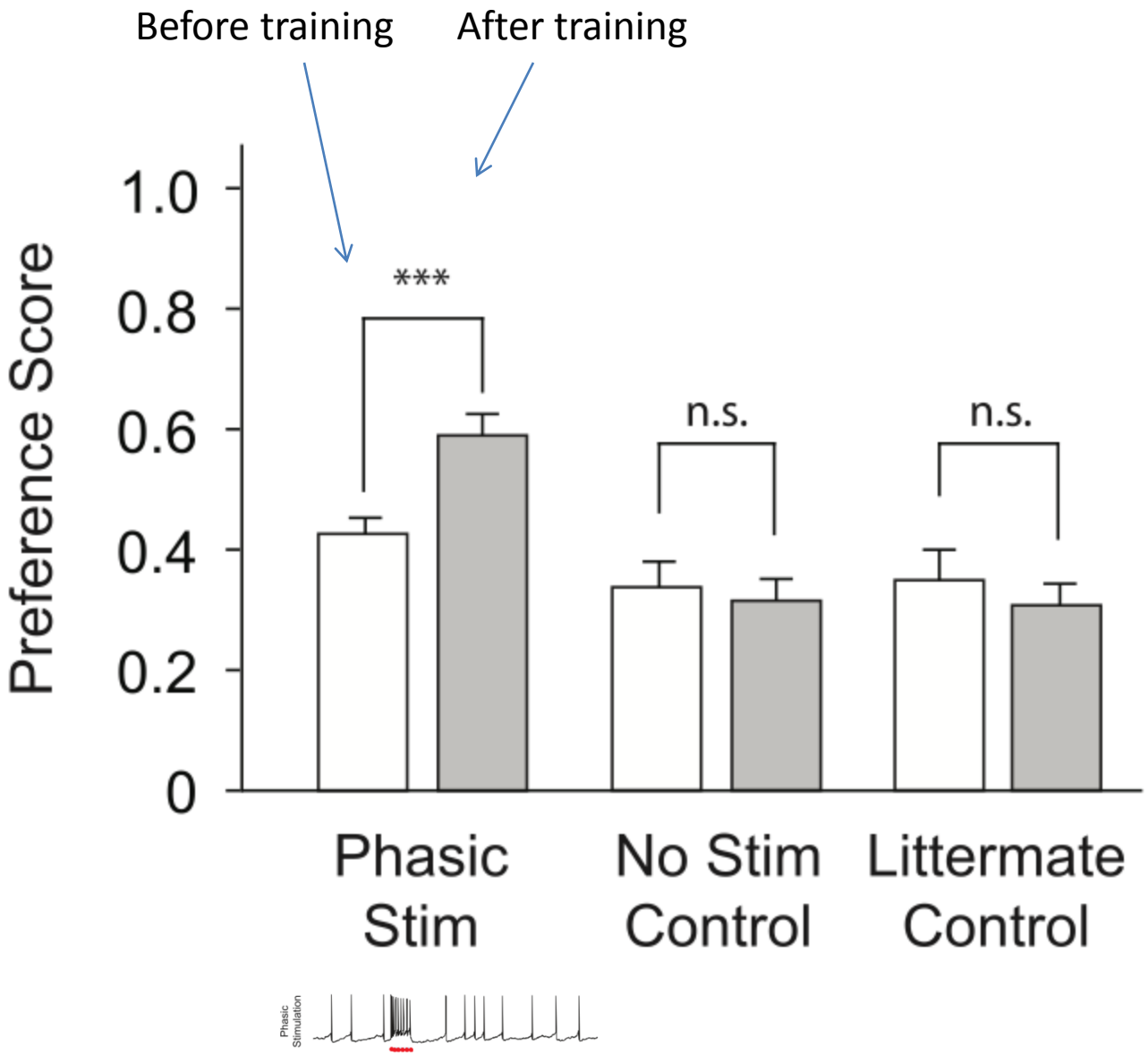
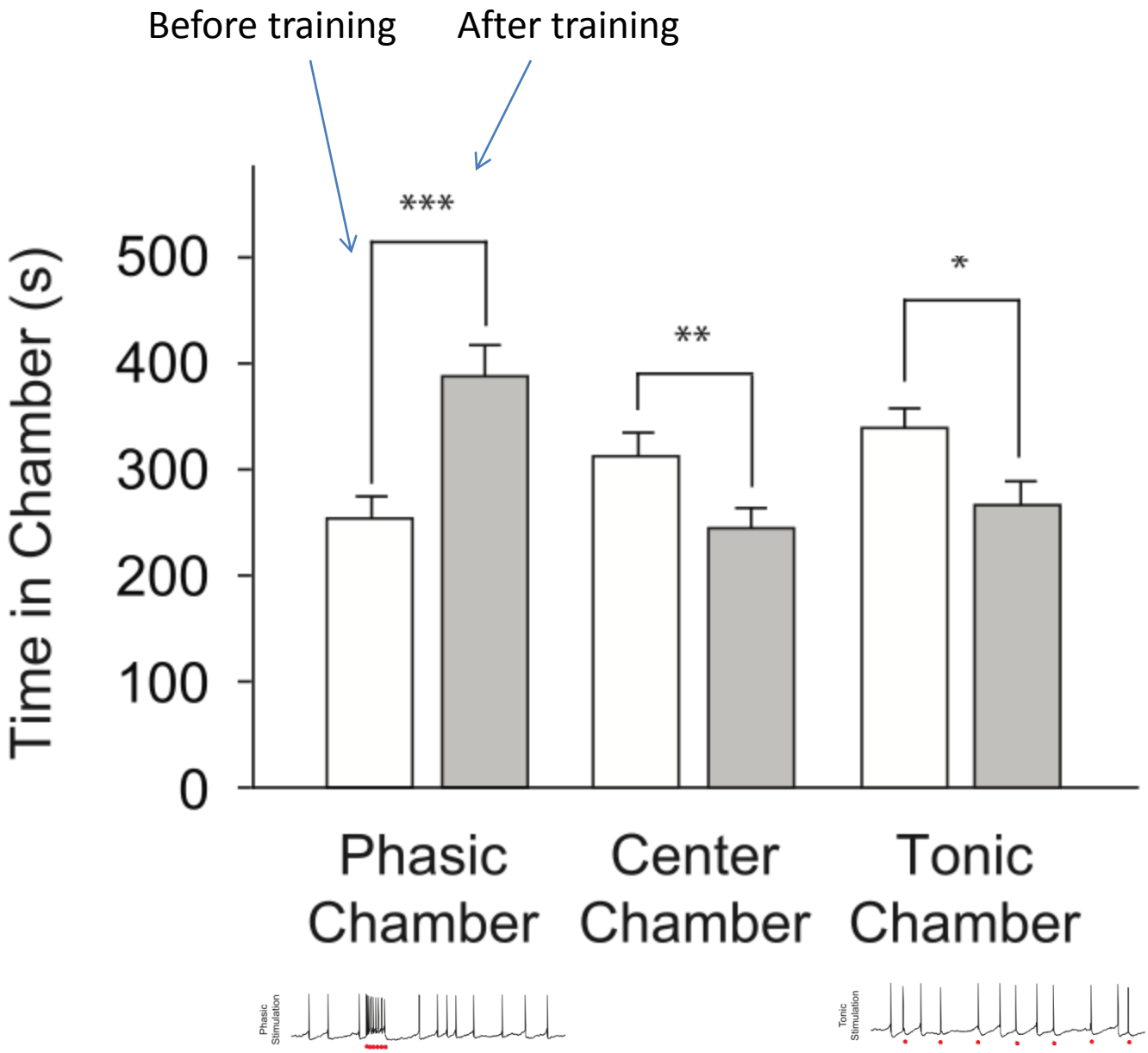


Tsai et al, 2009



Tsai et al, 2009