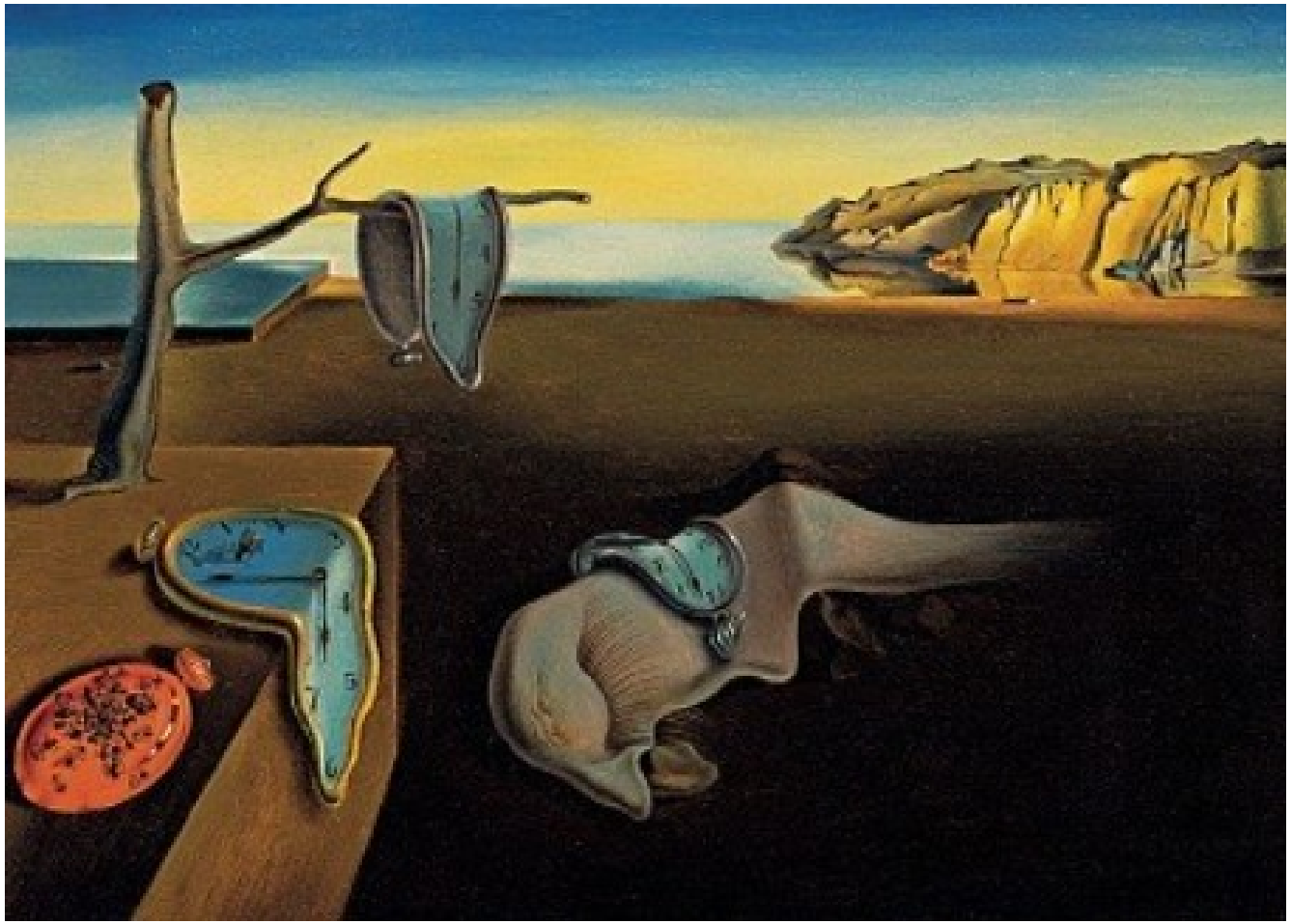


The Persistance of Memory – S. Dalí

Lost in Time:

Drawing from philosophy to inform Neuroscience

Luis de la Cuesta

12 / 03 / 2024

Tessellate Book Club

1st year anniversary!!

david robbe

Hello Luis. Thanks a lot for the interest. I just sent you the piece ....

14 oct. 2023 11:29 a. m.

```
----- The following addresses had permanent fatal errors -----
ldelacue@uni-mainz.de
    (reason: 554-mailgate-1.zdv.uni-mainz.de 554 Your access to this
please contact the intended recipient via alternate means.)
```

my email came back to me.

14 oct. 2023 11:32 a. m.

And here is the core of my email. :
Dear Luis,

Thanks so much (and I really mean it) for the interest in my piece on time perception. If at some point you would like me to discuss with your group of students, we could organize something (zoom discussion ?)..

Would love to get your feedbacks, be challenged, or clarify whatever difficulty this kind of topic inevitably brings

best regards,

David

Luis
@luisdelacuesta

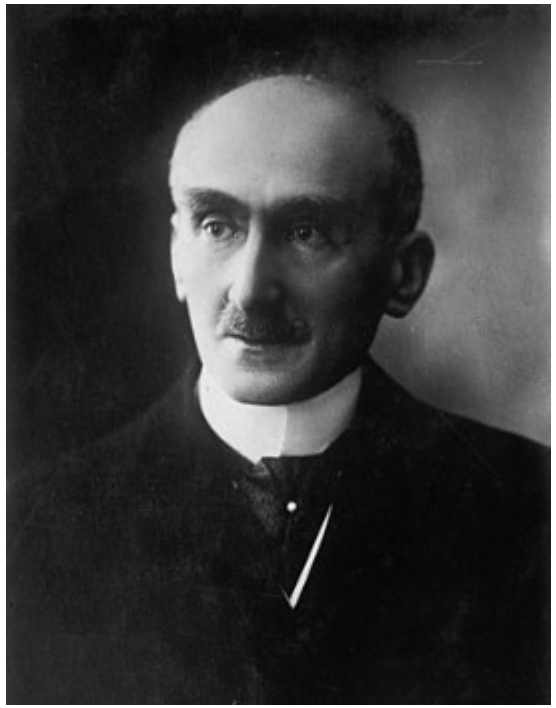
Hello David, I am PhD student working in rat behaviour. I would love to be able to read your article on time perception in animals. Futhermore, we have a book club run by students where we bring high level topics to discuss among us, and I would like to bring this article in one of our future meetings. Could I ask you for a full version of the article? My institution (University of Mainz) does not provide it. Thank you. Luis

14 oct. 2023 10:09 a. m.

My email is ldelacue@uni-mainz.de

14 oct. 2023 10:11 a. m.

Henri Bergson



Wikipedia

1859-1941
Paris

Raised in a Jewish family in Paris.
Studied Philosophy

Time and Free Will.	*1889*
Matter and Memory.	*1896*
Creative Evolution.	*1906*

Heated debate with Einstein 1922
(General Relativity & Simulateneity)

Nobel Prize in Literature 1927
In recognition of his rich and vitalizing ideas

Bergsonian view on time perception: Time Is Unlike Space

Quantitative time perception: what clocks measure

Qualitative time perception: **durée**

Bergsonian view on time perception: Time Is Unlike Space

Google Photos

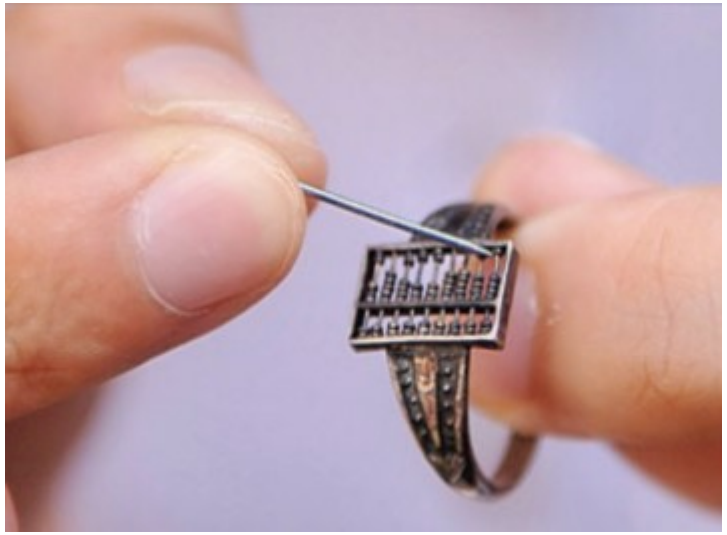
„You are not aware of how long a minute can last until you spend it planking“

Bergsonian view on time perception: Time Is Unlike Space

It is through comparison that our qualitative experience (duree) can be quantified.

…but in what are we relaying when we count time?

Counting is a spatial process



Robbe 2023

24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34…….

Time expressions have a spatial flavour

It took so long/ short to finish the meeting

Time flies / Time drags

The Case of Music

If we focus only in counting strokes (we strip away its qualia)

If we focus in its qualitative aspects, we allow the qualia to endure

Duree is only possible because our nervous system allows

merging our most recent sensation into the ongoing one.

Time & Bergson in a nutshell

- Animals have no way of perceiving time objectively because indivudal experiences merge into each other being indivisible (they endure). Like the individual notes played in a crescendo.

- They cannot be discretized and juxtaposed and therefore we need to externalize this operation (clocks, self-generated movements) to be able to measure time objectively.

Neuroscience & Biobehavioral Reviews
Volume 153, October 2023, 105312

Review article

Lost in time: Relocating the perception of duration outside the brain

David Robbe [a b]

What if Henri Bergson was right?

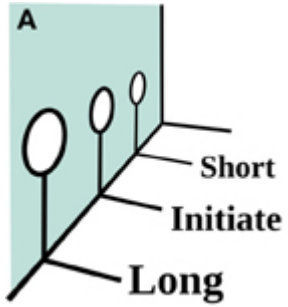
Disclaimer: Paper refers to durations that span second to minute range

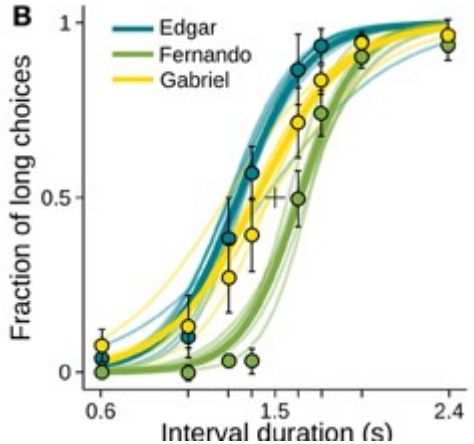
Inmed
Institut de neurobiologie de la méditerranée

2 hypothesis

- Animals have no way of estimating time objectively (Bergsonian)
- Animals have clock-based algorithms to estimate time

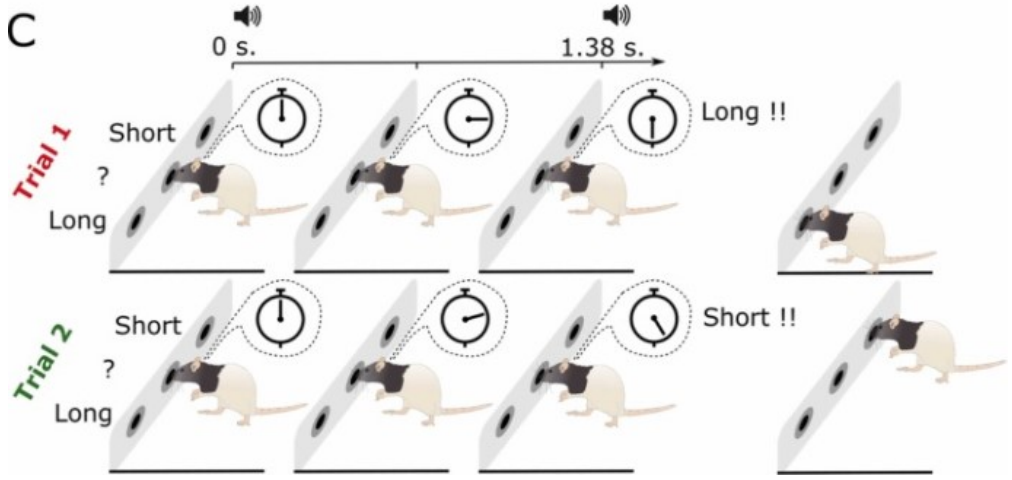
Behavioural Exp. N1 Rats

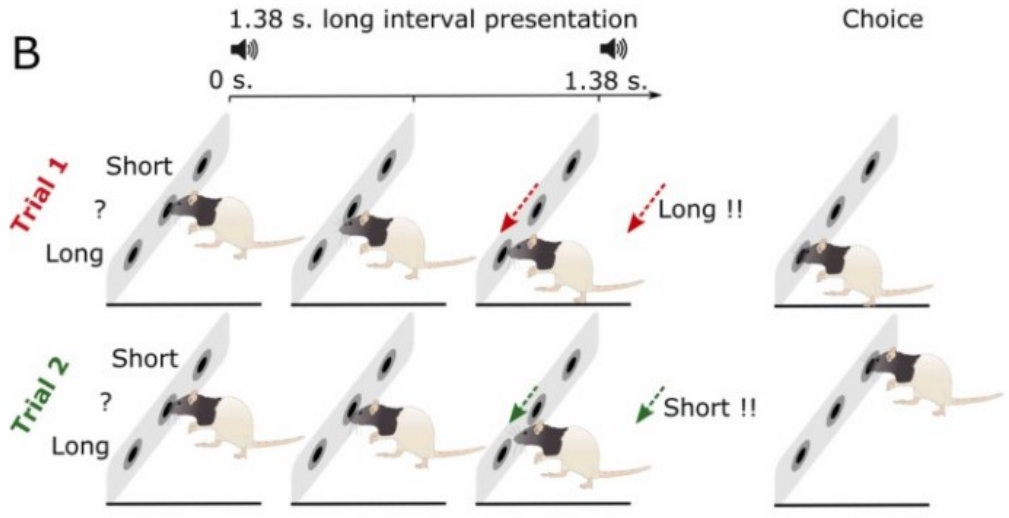




Goueva et al., 2014

Behavioural Exp. 1

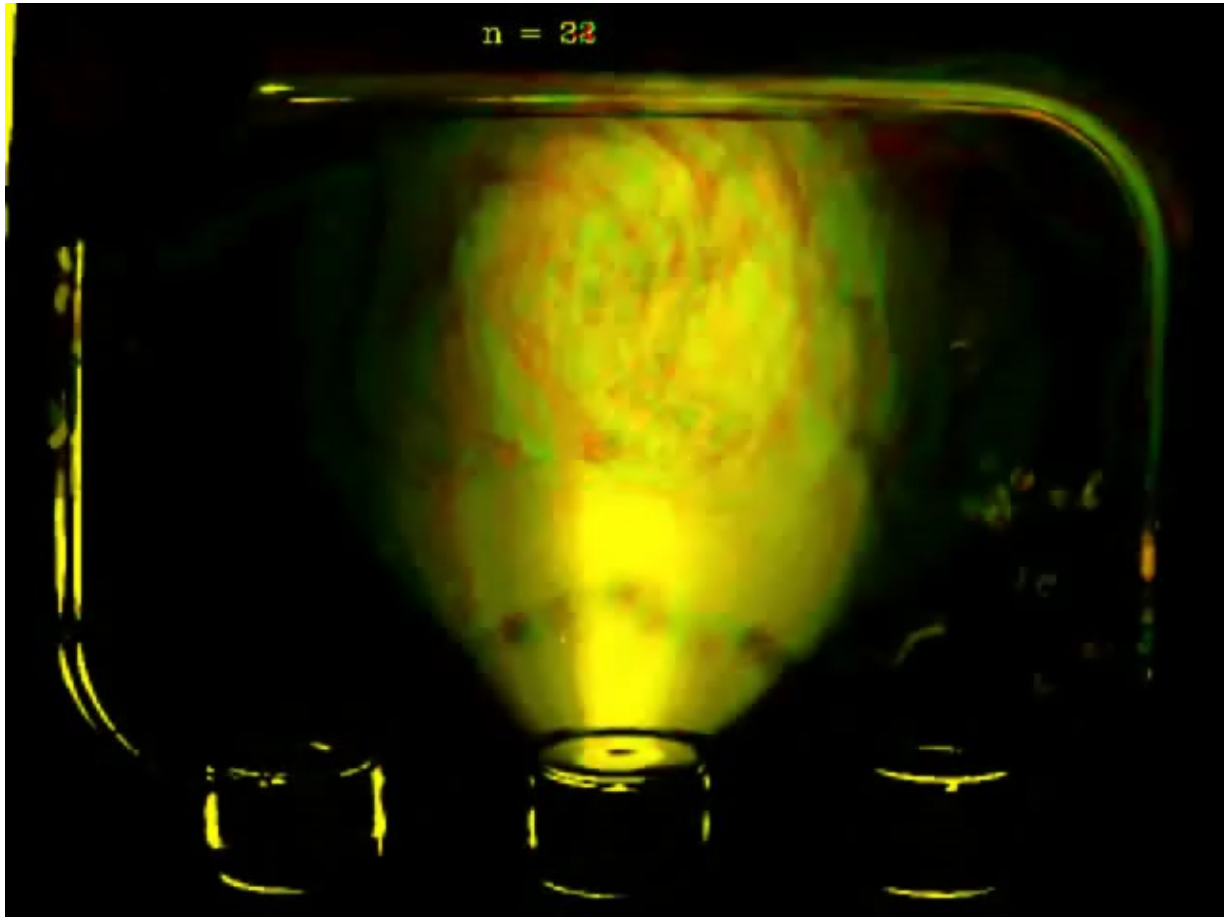




Goueva et al., 2014

Behavioural Exp 1.

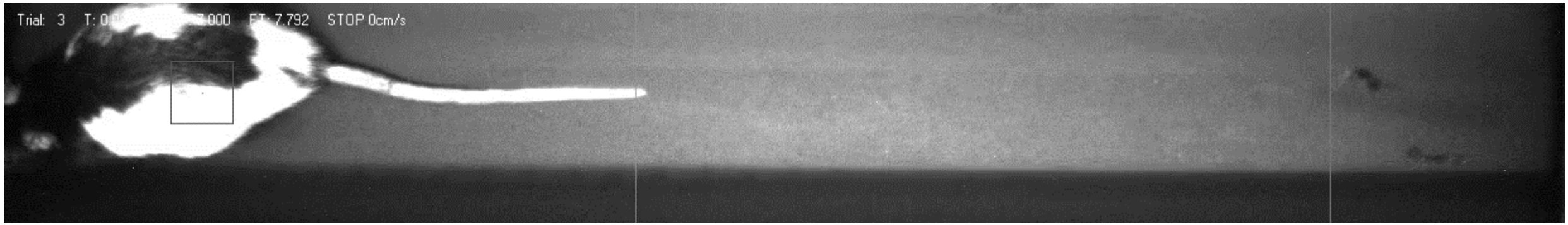
(Both Long & Short trials included)



Goueva et al., 2014

Behavioural Exp 2.

Force animals to estimate 7s in motion



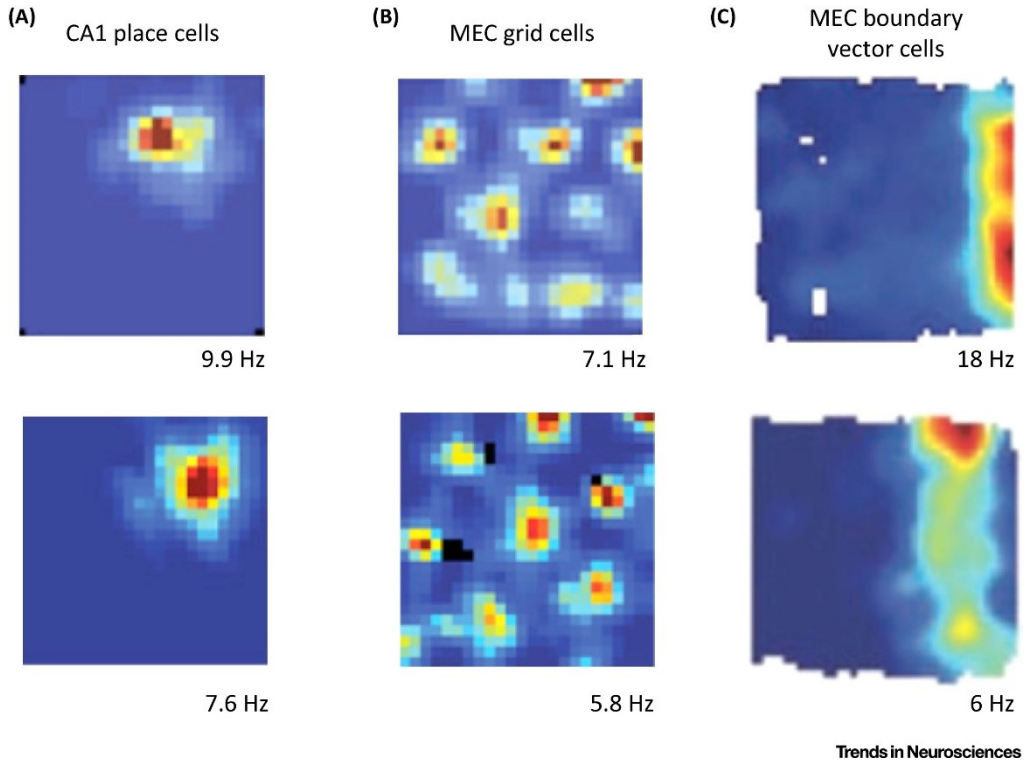
Safaie et al., 2020

Summing up Behavioural evidence

- When given the possibility animals display a range of self-generated movements when tasked to measure time intervals
- This is more in line with the Bergsonian hypothesis
- Experiments in inmobile animals are inconclusive (not shown today)

But what about in the brain…?

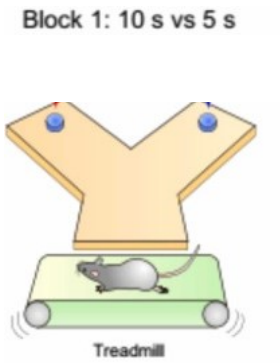
Coding of Space in the Brain

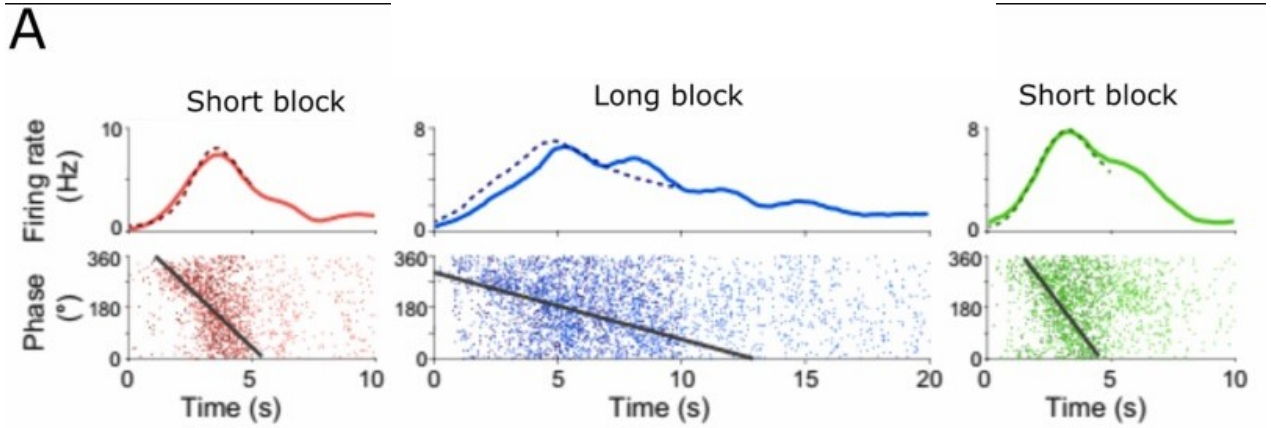


Sanders et al., 2015

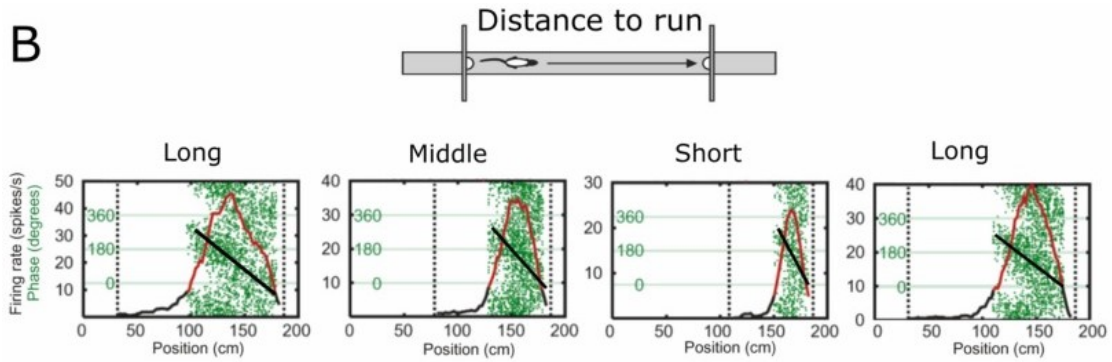
Evidence of time tracking in the Brain?

Time-cells in hippocampus ?



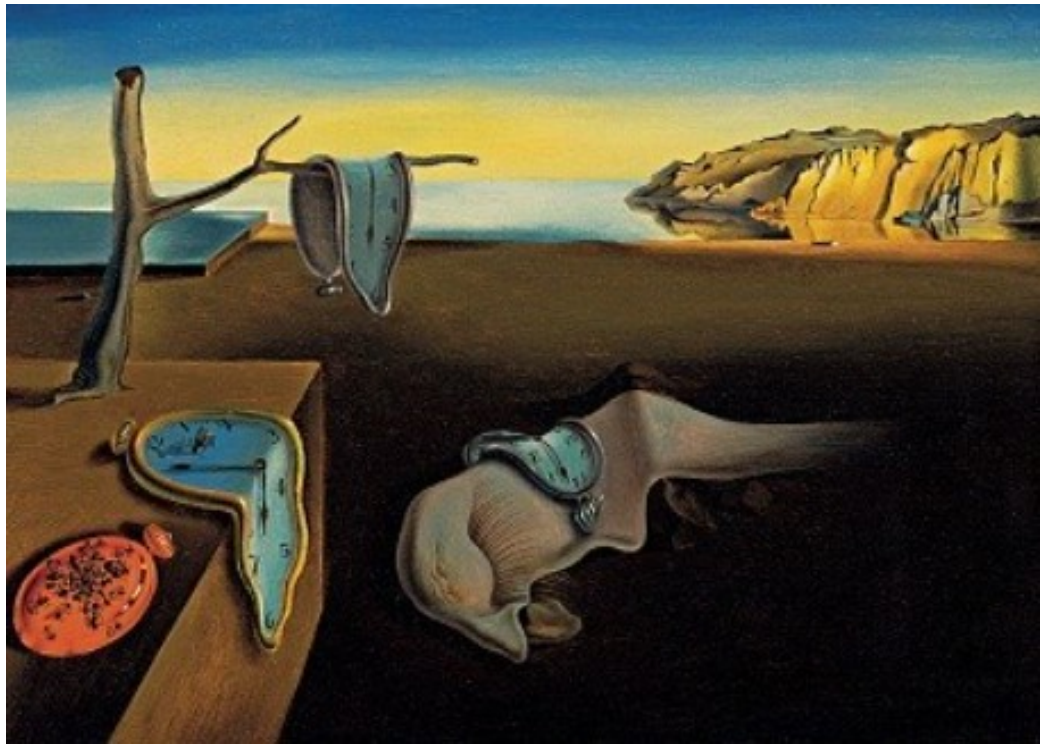


Shimbo et al., 2021

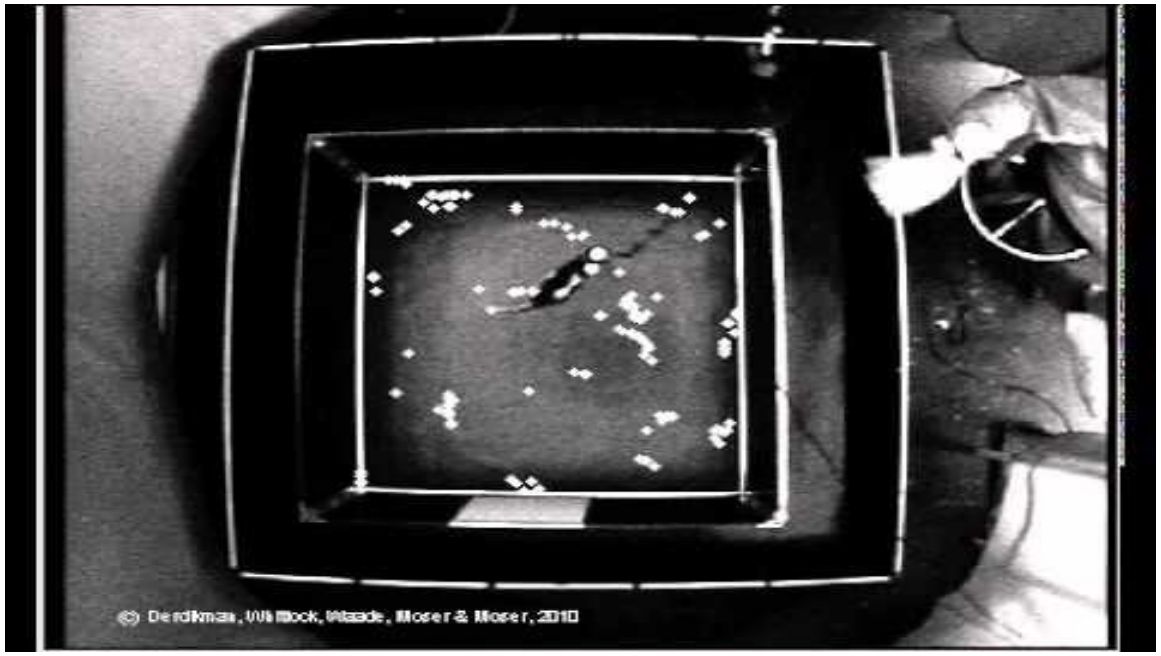


Modified from
Huxter et al., 2003

Lost in Time: Discussion with David

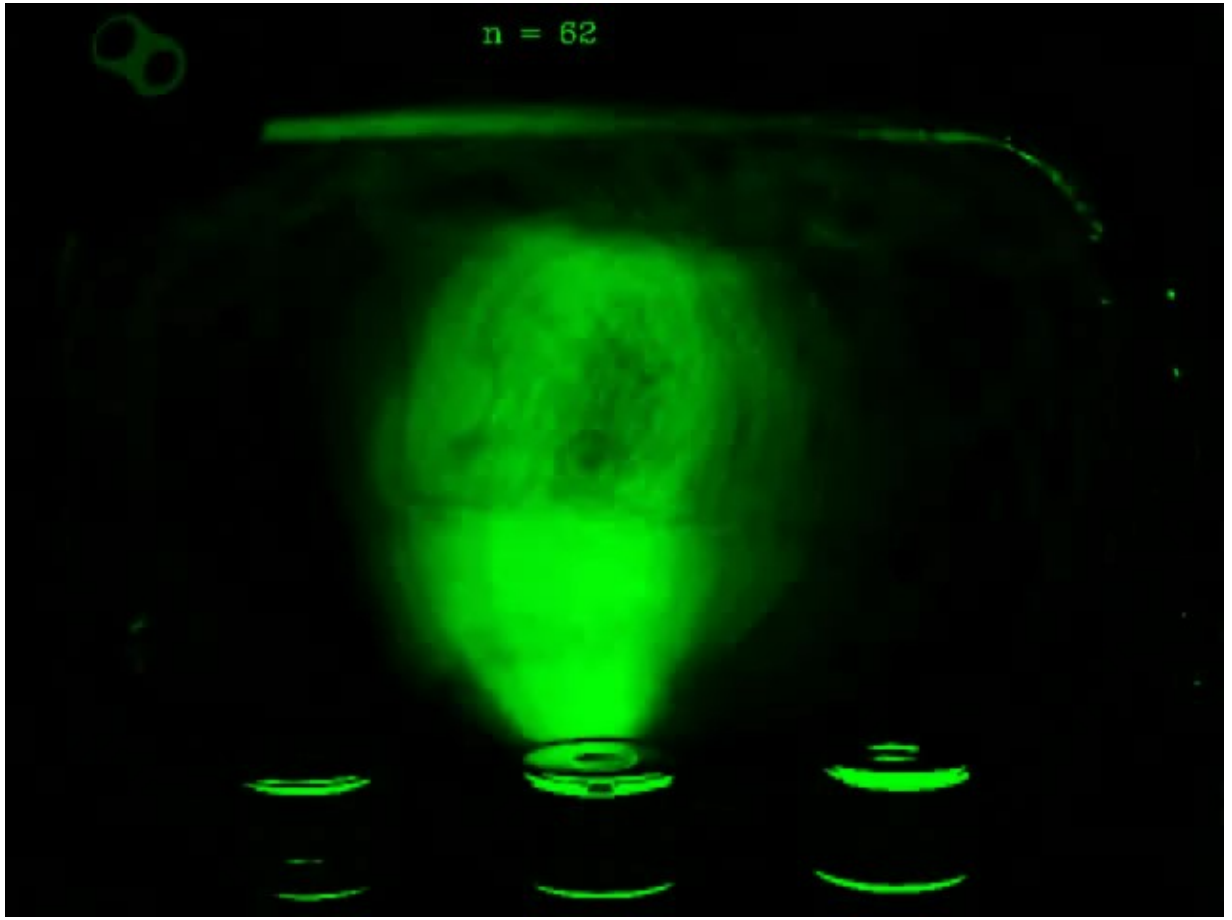


Coding of Space in the Brain



Behavioural Exp 1. Strategy 1

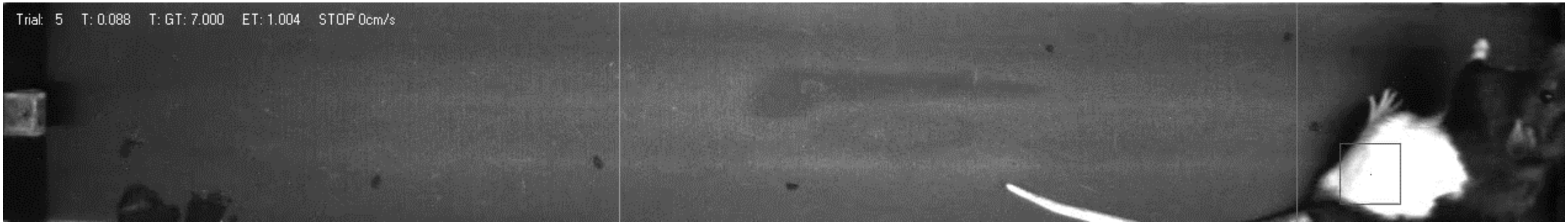
(Only Long trials included)



Goueva et al., 2014

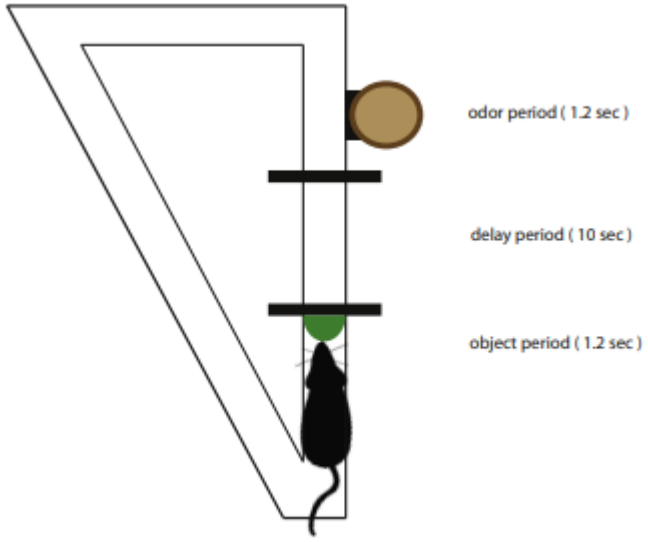
Behavioural Exp 2.

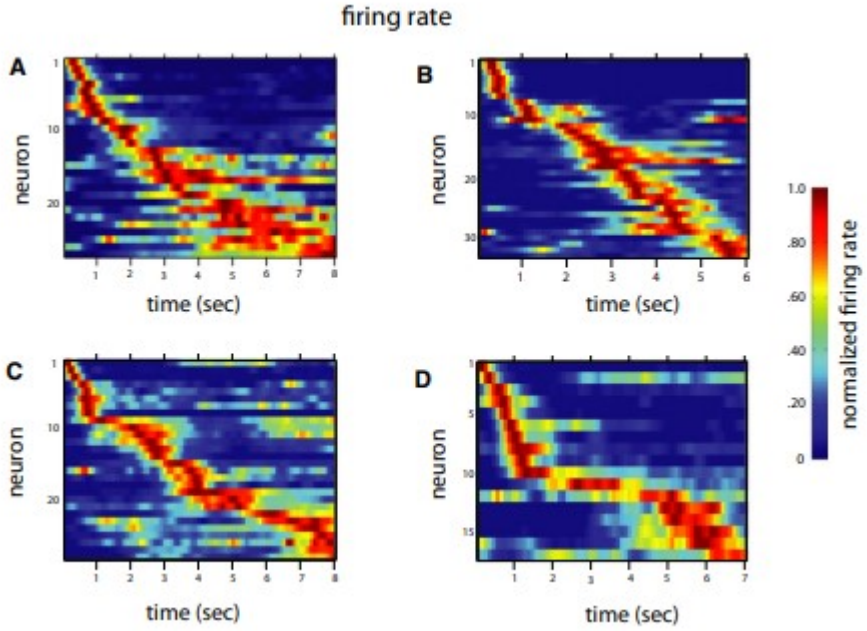
Force animals to estimate 7s in static



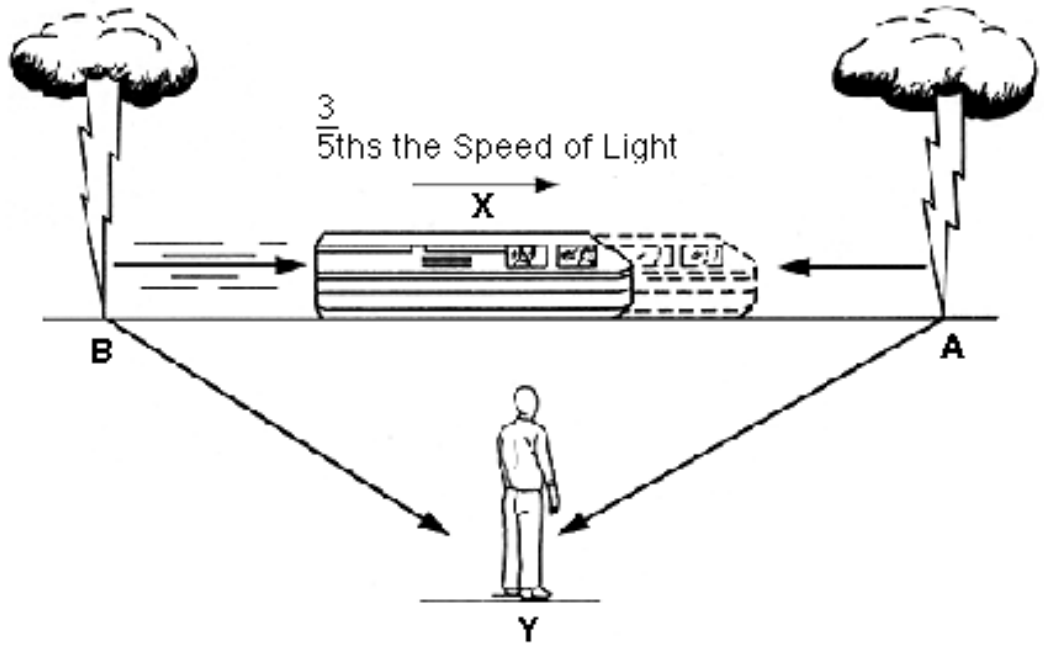
Safaie et al., 2020

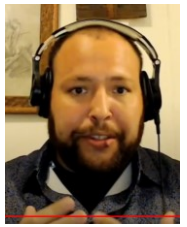
Time cells in hippocampus





MacDonalds et al., 2011





Michael Granado
Youtube

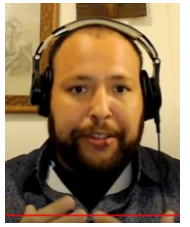
The Sorbonne, 1922

Bergson:

[*How does a trained ear percieve at each instant the total sound made by the orchestra and yet, if it pleases, untangle the notes played by two or more instruments? Simultaneous events, indivisible if we want are also divisible if we want…*]

Einstein:

[*But there are objective events, independent of individuals, and from the simultaneity of perceptions we have passed on to the simultaneity of events themselves… But nothing in our consciousness allows us to conlcude the simultaneity of the events, for these are only mental constructions…]*



Michael Granado
Youtube