

A close(r) look at
worm sleep

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Introduction




"Precision
measurements"
of behavior



Homeostasis

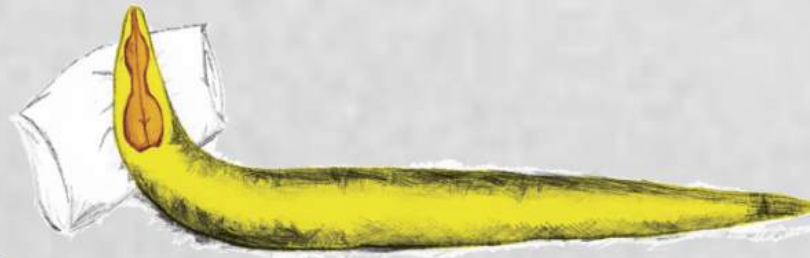


Future /
Conclusions



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Why sleep?



Why sleep?

...what we, *to our detriment*, get around to only once we are done working and entertaining ourselves.



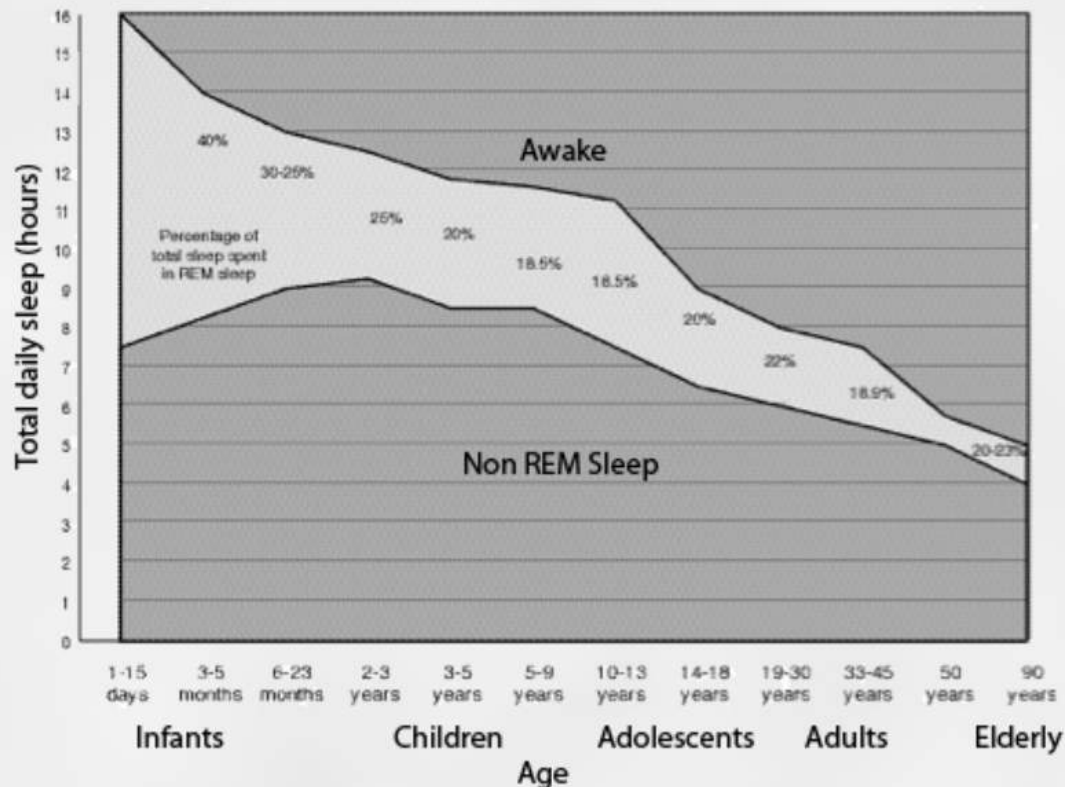
- Universal
- Essential

(Campbell and Tobler, 1984)

(Cirelli and Tononi, 2008)

Sleep affects structural plasticity (notably, during development)

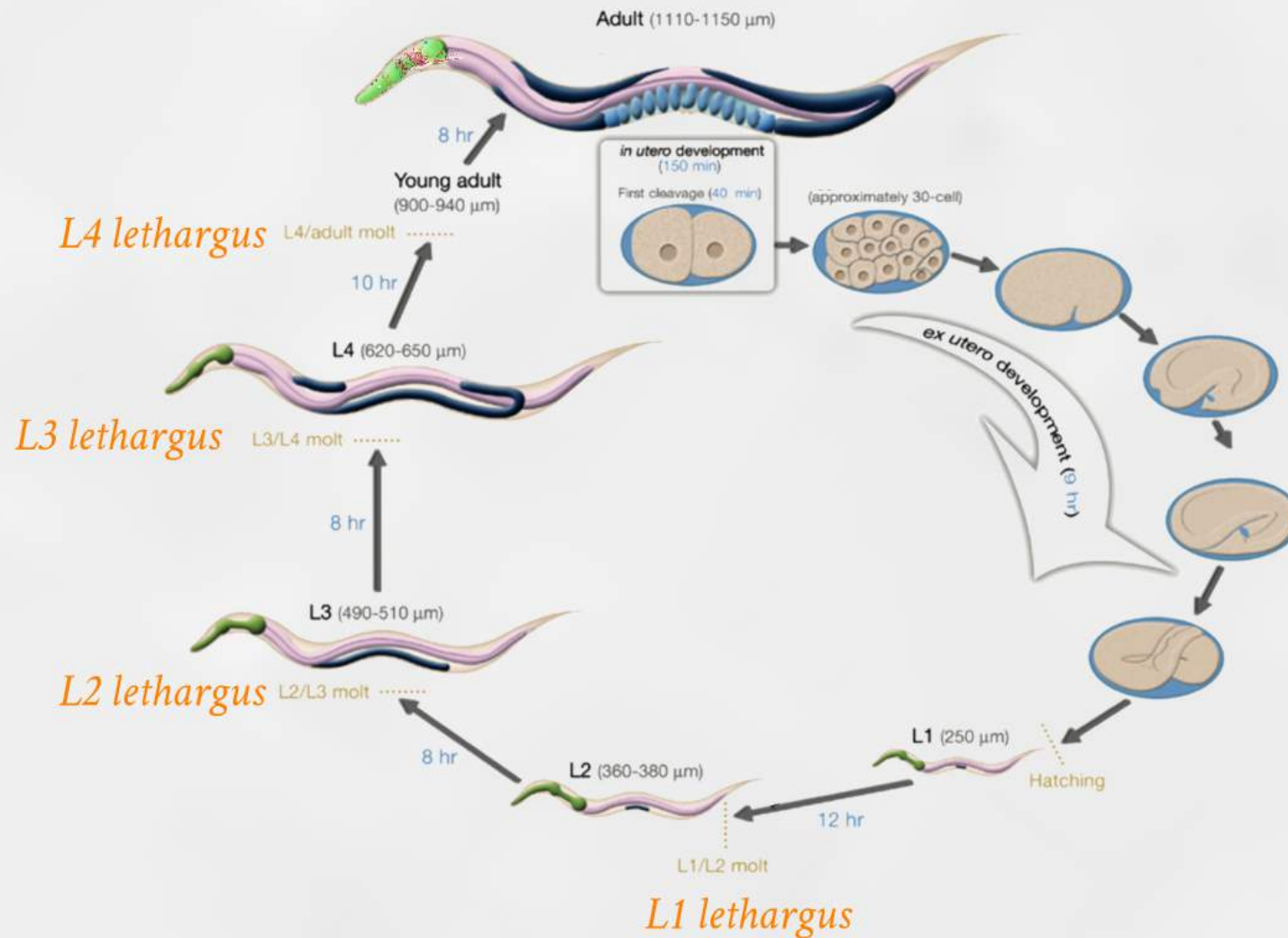
...although these effects have been minimally explored.

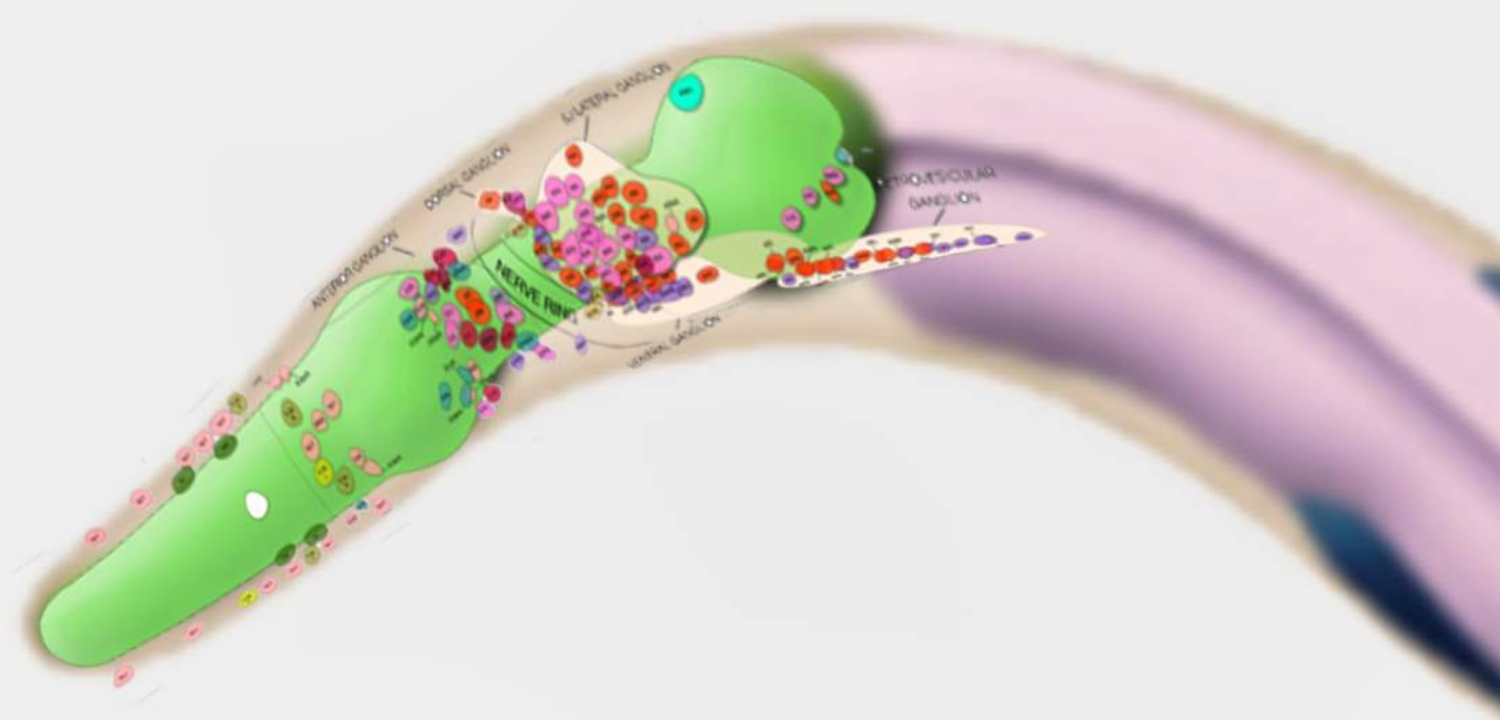


"The prime role of "dreaming sleep" in early life may be in the development of the central nervous system."

(Roffwarg et al., 1966; Peterson, 1997)

Why worms?



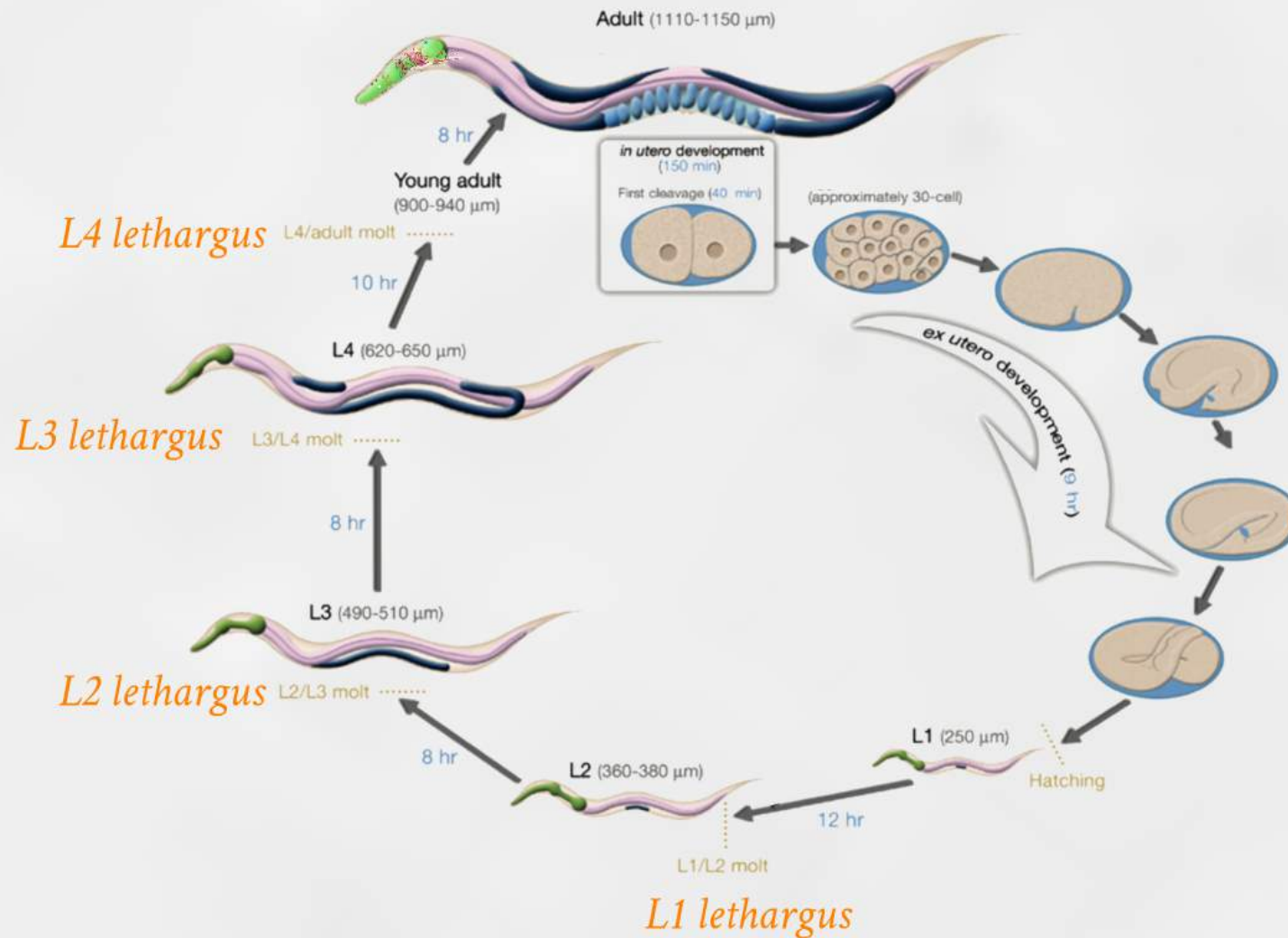


8 hr





Why worms?



"Precision measurements" of behavior

Continuous prolonged, low error rate



Non heuristic / generalizable

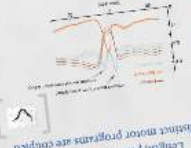
- Object recognition using a statistical model
- He also requires high power computing resources



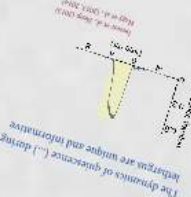
The dynamics of posture reveal (locomotion) behavior



Length, posture, and behavior: distinct motor programs are coupled

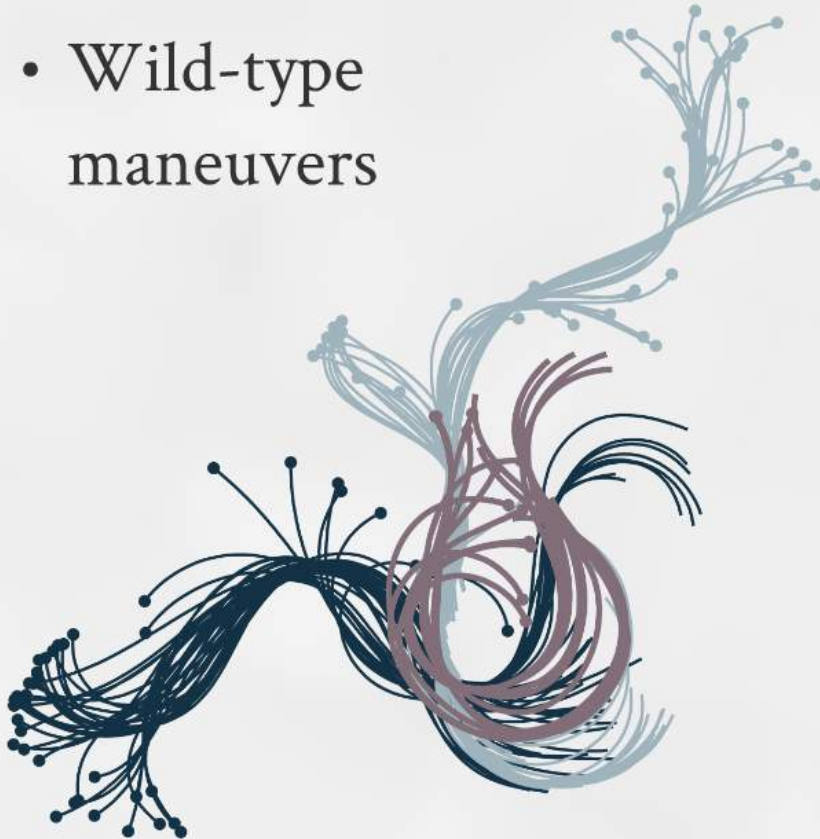


The dynamics of gait (.) during behavior are unique and informative

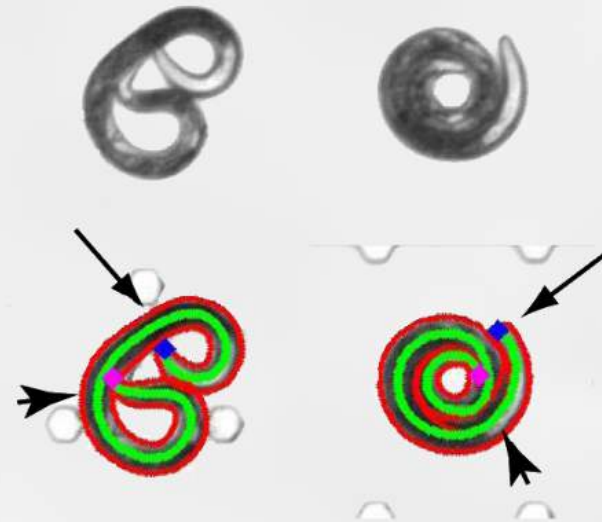


Continuous, prolonged, low error rate

- Wild-type maneuvers

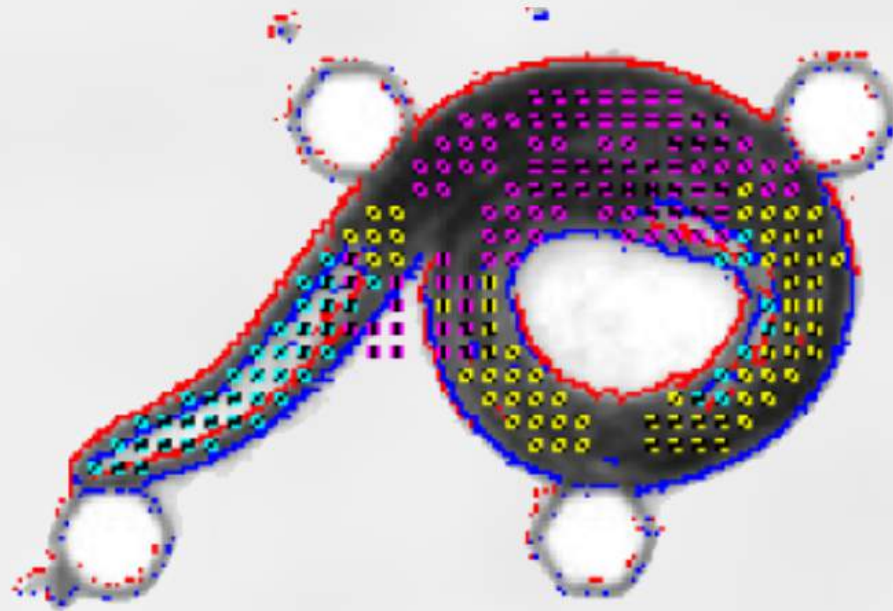


- Mutations affecting posture



(In collaboration with Marc Goessling, Yali Amit)

Non heuristic / generalizable

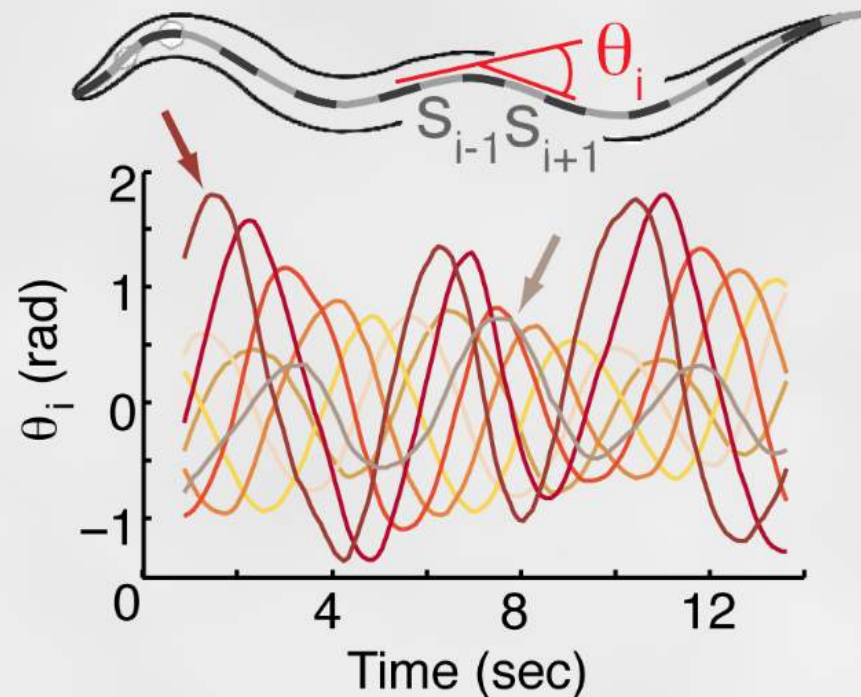


- Object recognition using a statistical model
- Big data requires high power computing resources

(In collaboration with Marc Goessling, Yali Amit)



The dynamics of posture reveal (locomotion) behavior

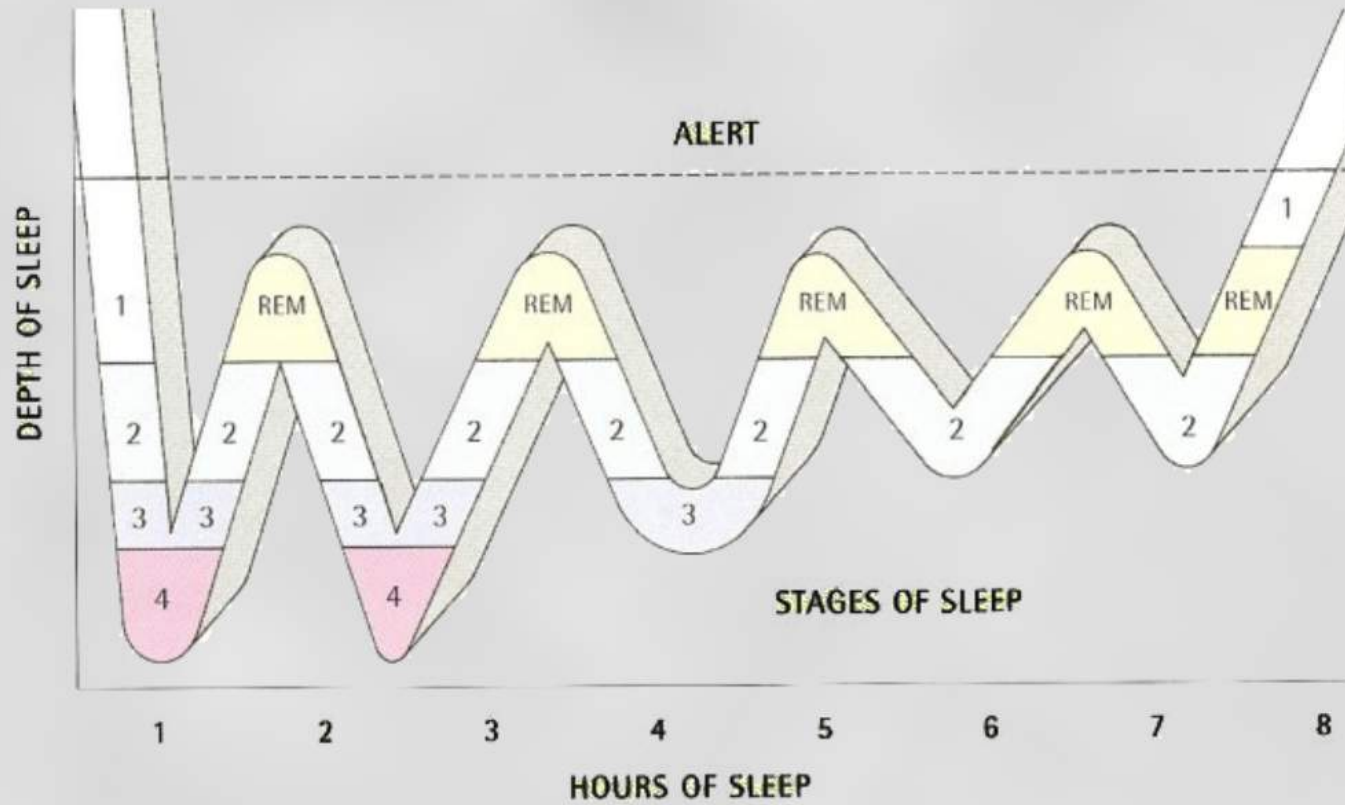


- No information from lab frame of reference ("no map")

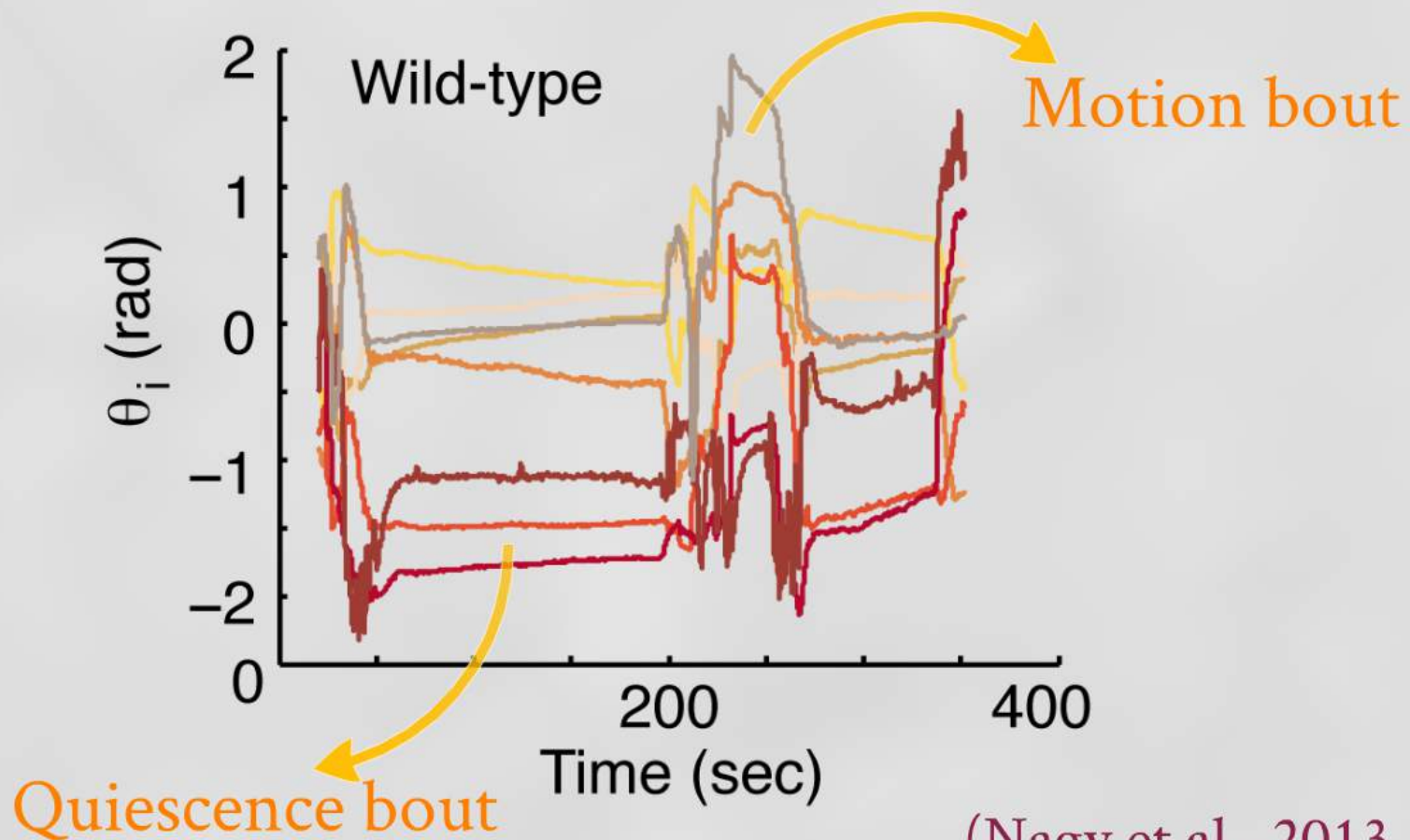


Homeostasis

Sleep has an architecture and disruptions are *compensated* for (homeostasis)

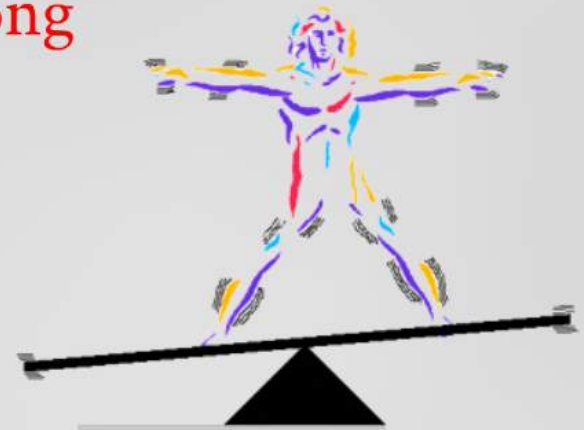


Stabilization of sleep in mild noise is
distinct from compensation after
severe agitation



(Nagy et al., 2013
Nagy et al., 2014)

Any state, realistically, would require
to withstand finite noise;
routine stabilization in mild noise is
distinct from compensation for strong
agitation.



An *ancient* relation between sleep (?) and development, where **plasticity scales with brain size.**



Universality?

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