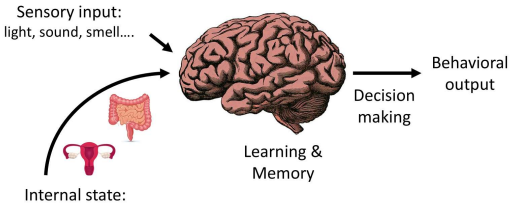
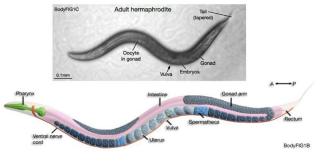
Mori group (森 郁恵 实验室)

How do we think?



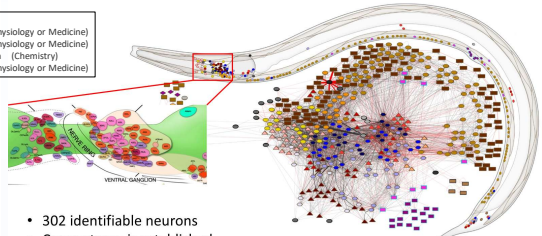
C. elegans: ideal genetic model



Nobel prizes
- 2002 Apoptosis (Physiology or Medicine)
- 2006 RNAi (Physiology or Medicine)
- 2008 GFP application (Chemistry)
- 2024 microRNA (Physiology or Medicine)

- **70% of *C. elegans* genes are homologous to human genes**
- **Shared biological processes (neuronal communication, memory, aging) with mammals**
  - Hermaphrodites and males: mendelian genetics
  - Short life cycle: 3.5 days at 20°C
  - Transparency
  - Cell lineage: 959 somatic cells
  - Genome sequence → Expression profile of ~20000 genes in each cell

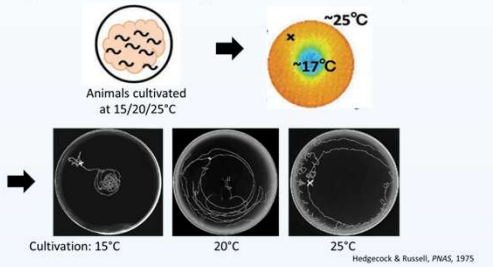
The nervous system of *C. elegans*



- 302 identifiable neurons
- Connectome is established

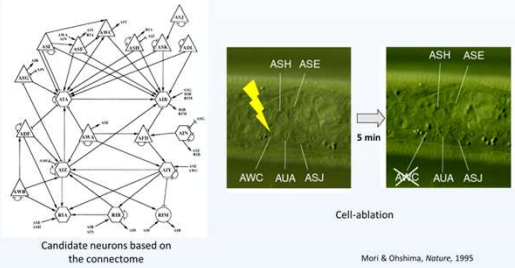
White et al., *Philos. trans. R. Soc. London Ser. B Biol. Sci.*, 1986
Cook et al., *Nature*, 2019

C. elegans remembers past cultivation temperature



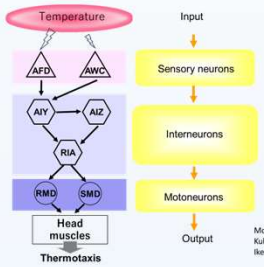
Hedgecock & Russell, *PNAS*, 1975

Identification of neurons involved in thermotaxis



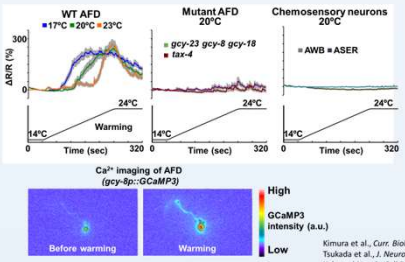
Mori & Ohshima, *Nature*, 1995

Neural circuit model of thermotaxis



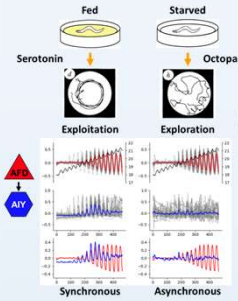
Mori and Ohshima, *Nature*, 1995
Kuhara, Okumura *et al.*, *Science*, 2008
Ikeda et al. *PNAS*, 2020

AFD neurons cell-autonomously store temperature memory



Kimura et al., *Curr. Biol.*, 2004
Tsukada et al., *J. Neurosci.*, 2016
Kobayashi et al., *Cell Reports*, 2016

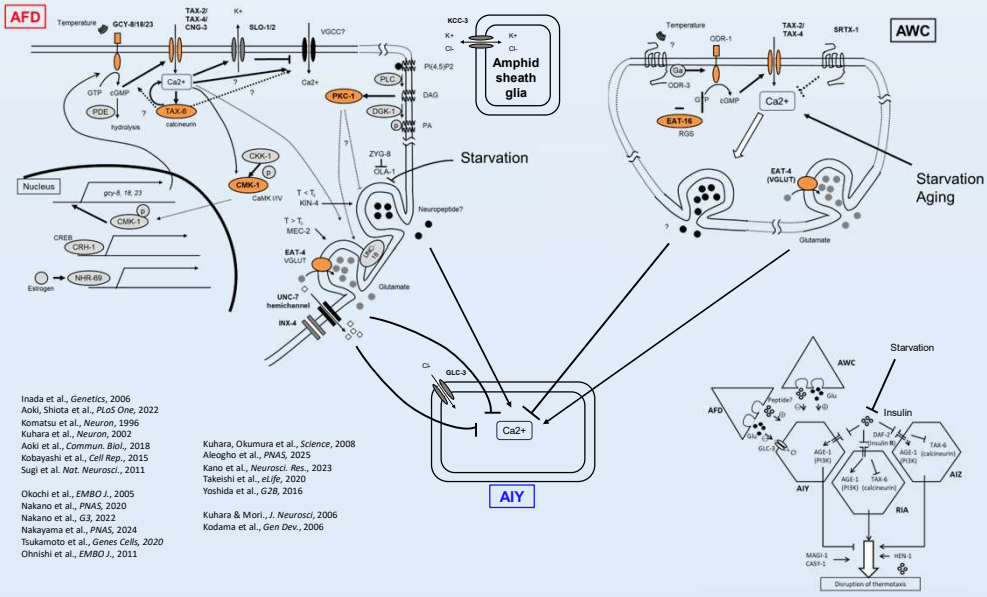
Feeding states regulate switching between exploitation and exploration



Hedgecock and Russell, PNAS, 1975;
Mohri et al., Genetics, 2005

Matsuyama and Mori, *eNeuro*, 2020;
Aoki, Jurado, Nawa, Kondo et al., *PLoS Genet.*, 2022

Molecules involved in the circuit dynamics



Inada et al., *Genetics*, 2006
Aoki, Shiota et al., *PLoS One*, 2022
Komatsu et al., *Neuron*, 1996
Kuhara et al., *Neuron*, 2002
Aoki et al., *Commun. Biol.*, 2018
Kobayashi et al., *Cell Rep.*, 2015
Sugi et al. *Nat. Neurosci.*, 2011

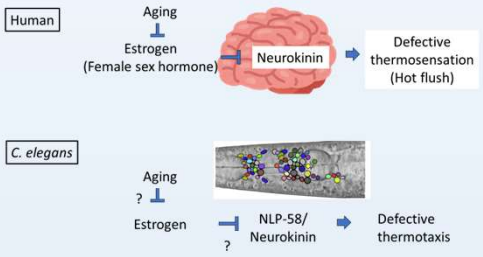
Okochi et al., *EMBO J.*, 2005
Nakano et al., *PNAS*, 2020
Nakano et al., *G3*, 2022
Nakayama et al., *PNAS*, 2024
Tsukamoto et al., *Genes Cells, 2020*
Ohnishi et al., *EMBO J.*, 2011

Kuhara, Okumura et al., *Science*, 2008
Aleogho et al., *PNAS*, 2025
Kano et al., *Neurosci. Res.*, 2023
Takeishi et al., *eLife*, 2020
Yoshida et al., *G2B*, 2016

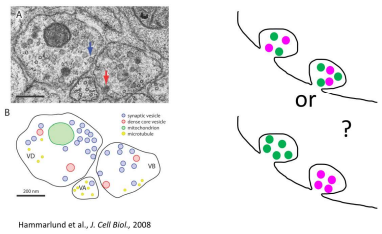
Kuhara & Mori., *J. Neurosci*, 2006
Kodama et al., *Gen Dev.*, 2006

Ongoing projects

C. elegans as an aging (menopause) model

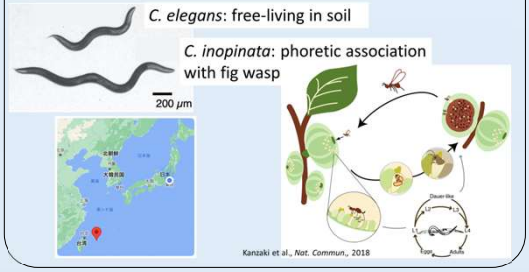


Neuropeptidergic co-transmission



Hammarlund et al., *J. Cell Biol.*, 2008

Toward comparative evolutional studies



Kanzaki et al., *Nat. Commun.*, 2018