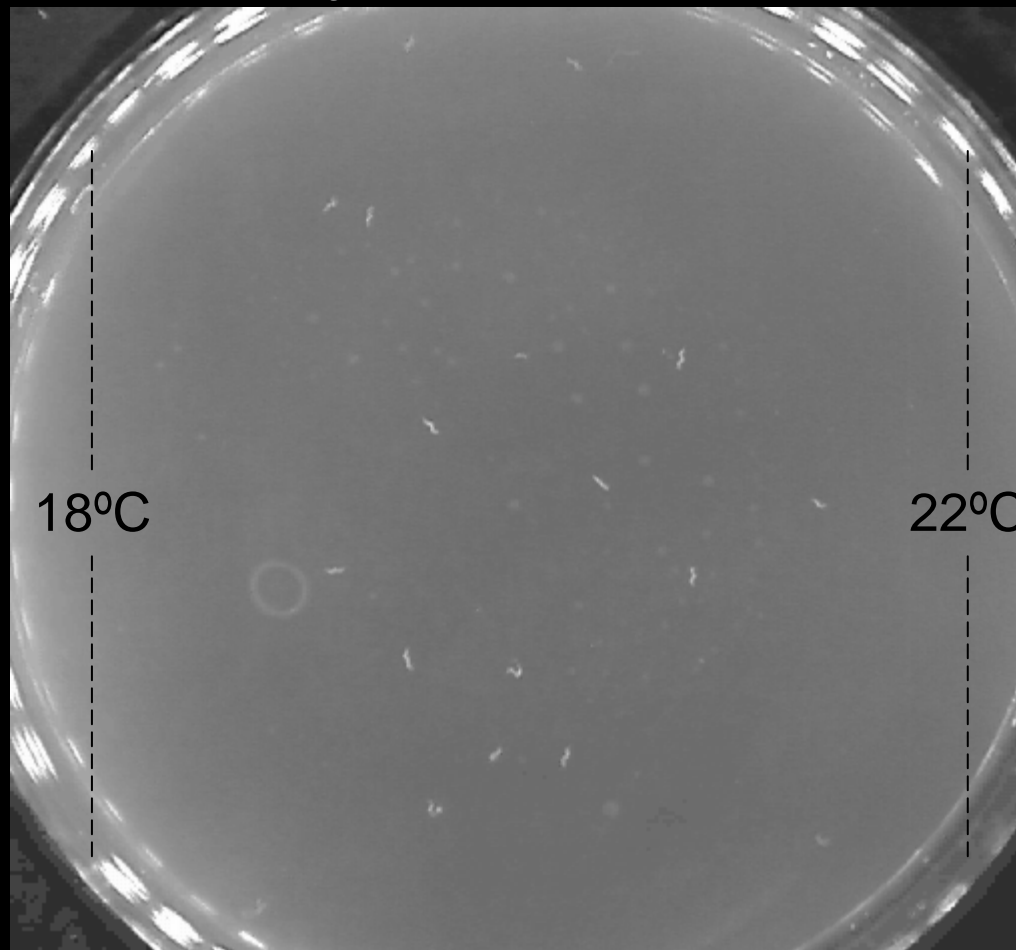


Thermotactic behavior depends on the previous cultivation temperature (T_s) and on the ambient temperature (T)

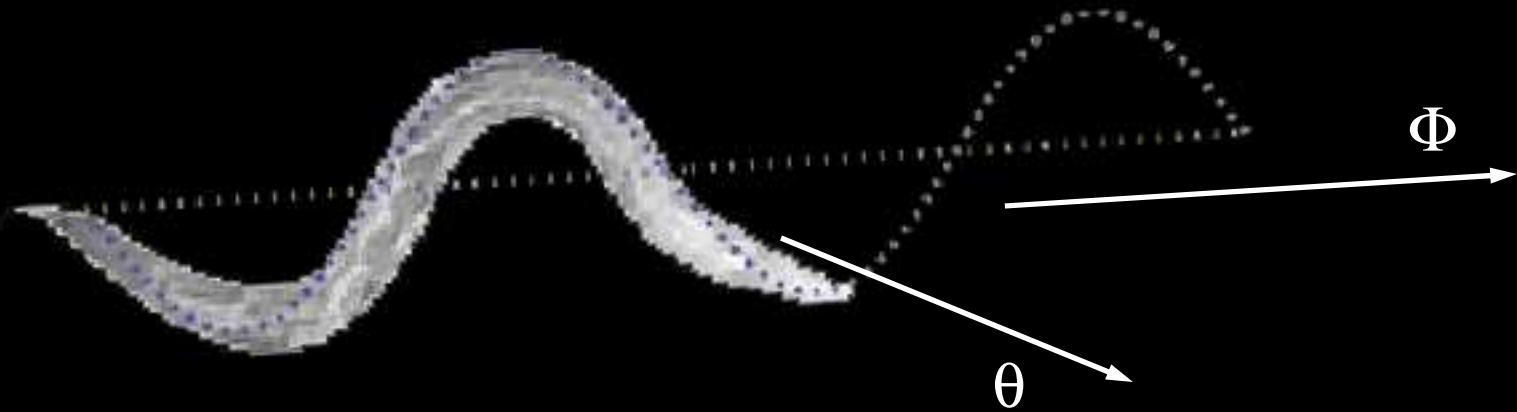
(Hedgecock and Russell, 1975)

(Mori and Ohshima, 1995)

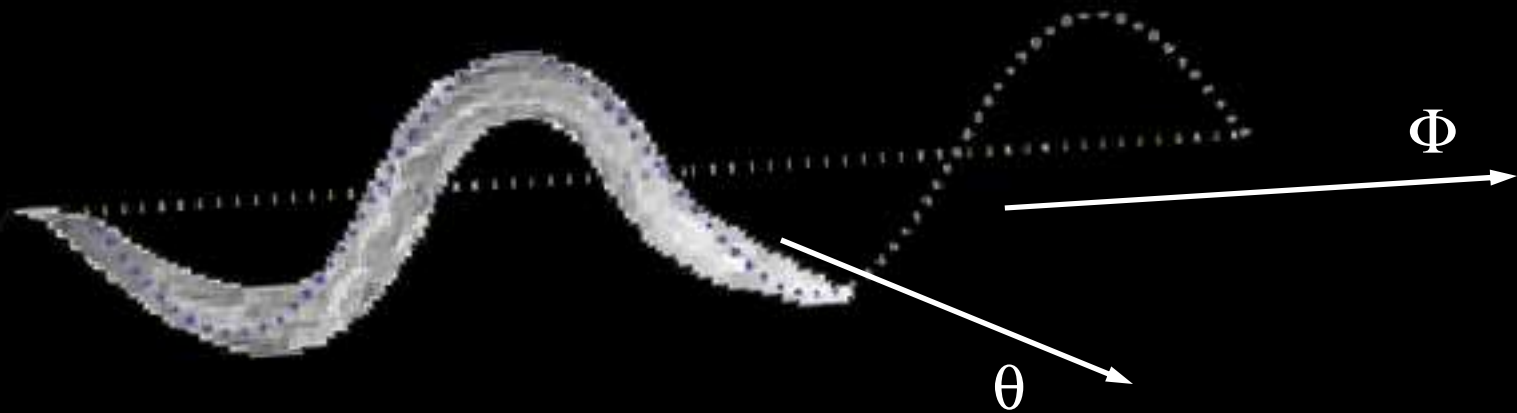
- $T = T_s$: Isothermal Tracking



The worm's motion while tracking (between turns)



The worm's motion while tracking (between turns)



$$\theta(t) = \Phi + \theta_0 \sin(\omega t) \quad (1)$$

$$\Phi = \langle \theta \rangle = \frac{1}{2\pi/\omega} \int_t^{t+2\pi/\omega} \theta(\tau) d\tau \quad (2)$$

The equation of motion of the worm's head while tracking isotherms on a temperature gradient

$$\ddot{\theta} = \theta_0 \omega^2 \sin(\omega t) \quad (3)$$

The equation of motion of the worm's head while tracking isotherms on a temperature gradient

$$\ddot{\theta} = \theta_0 \omega^2 \sin(\omega t) \quad (3)$$

$$\ddot{\theta} = \theta_0 \omega^2 \sin(\omega t) [1 + gT^2] \quad (4)$$

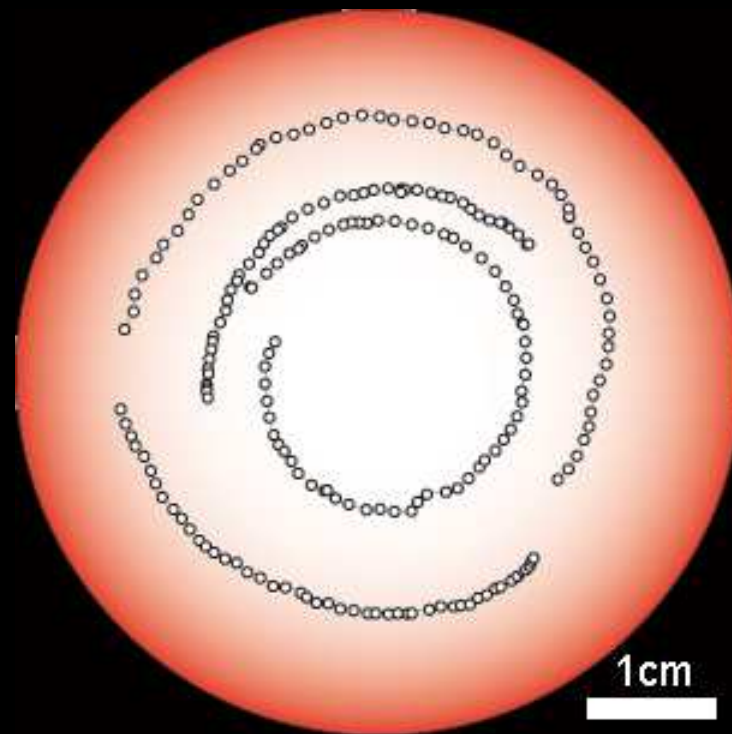
The equation of motion of the worm's head while tracking isotherms on a temperature gradient

$$\ddot{\theta} = \theta_0 \omega^2 \sin(\omega t) \quad (3)$$

$$\ddot{\theta} = \theta_0 \omega^2 \sin(\omega t) [1 + g\dot{T}^2] \quad (4)$$

$$\dot{T} = v \sin(\theta) |\nabla T| \quad (5)$$

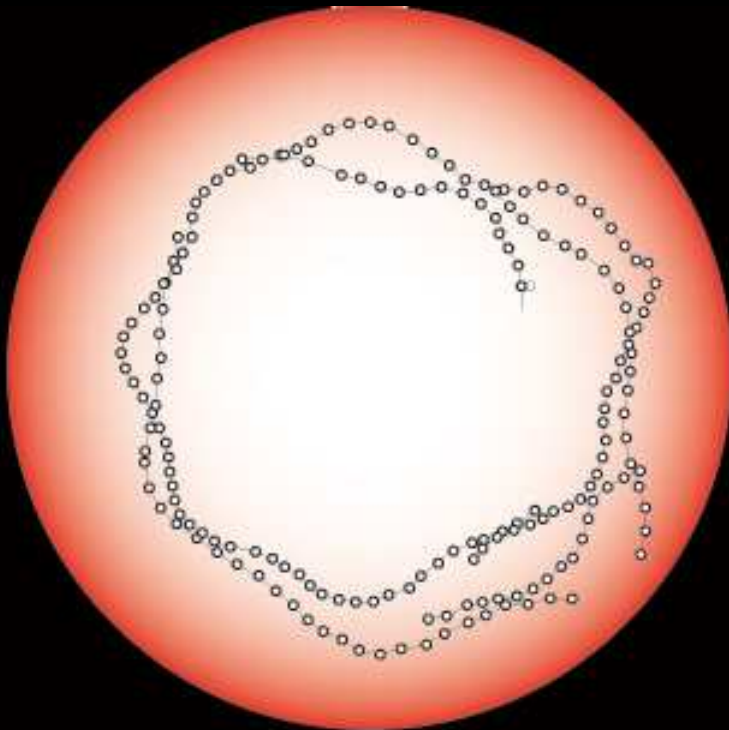
Isothermal tracking on a radial spatial temperature gradient



spatial T gradient: $0.7^{\circ}\text{C}/\text{cm}$

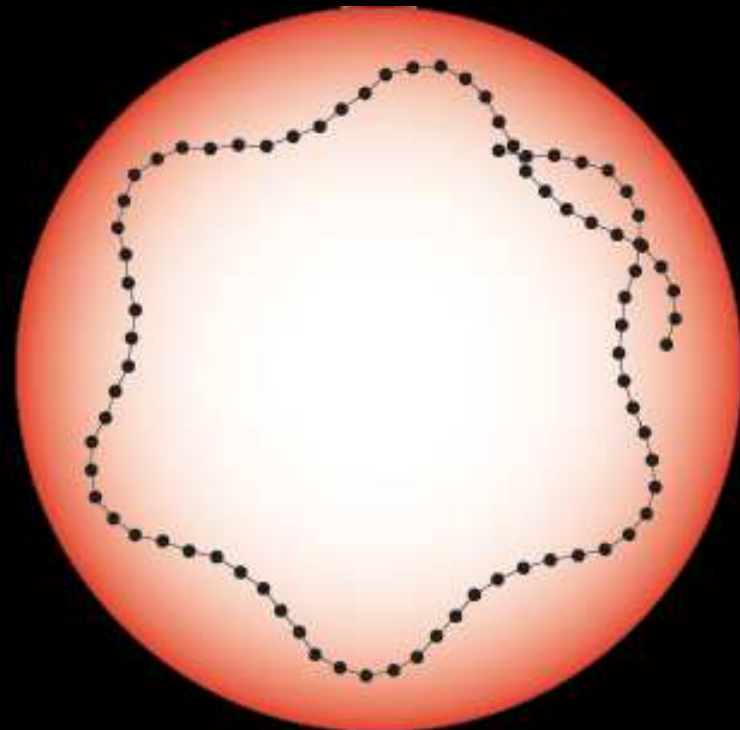
Isothermal tracking on a radial spatial temperature gradient with superposed temporal temperature oscillations

(Experiment)



spatial T gradient: $0.4^{\circ}\text{C}/\text{cm}$
temporal T oscillations: 0.1°C , 120 sec

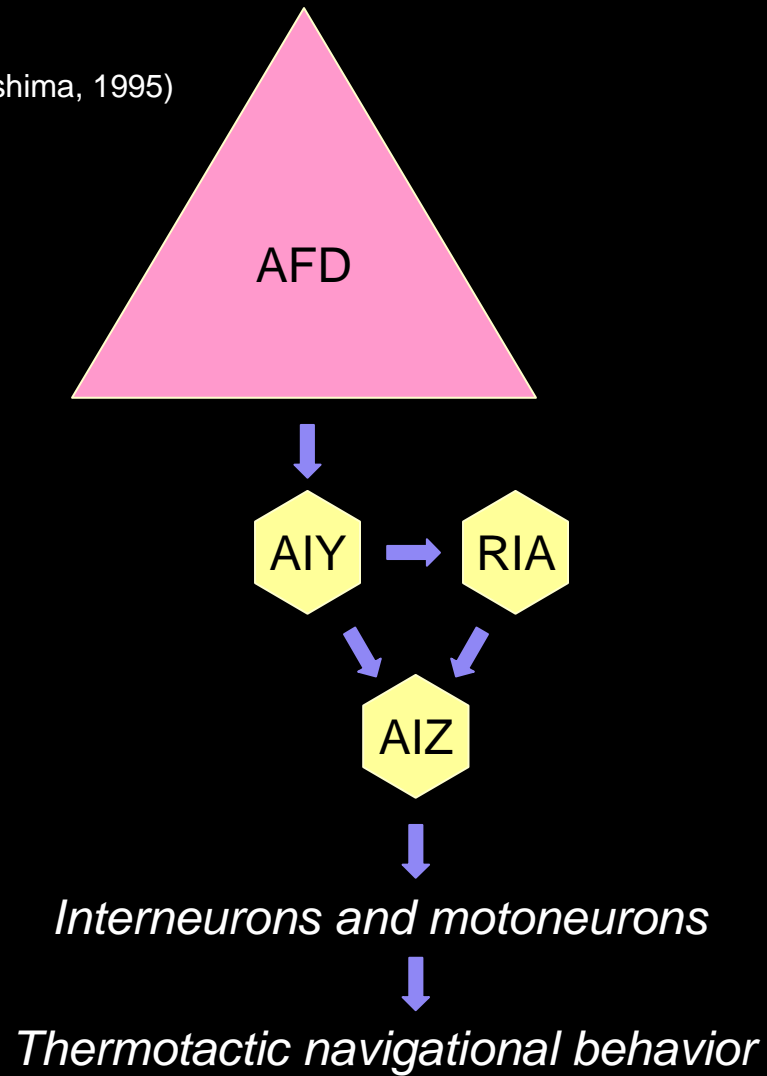
(Simulation)



spatial T gradient: $0.4^{\circ}\text{C}/\text{cm}$
temporal T oscillations: 0.1°C , 120 sec

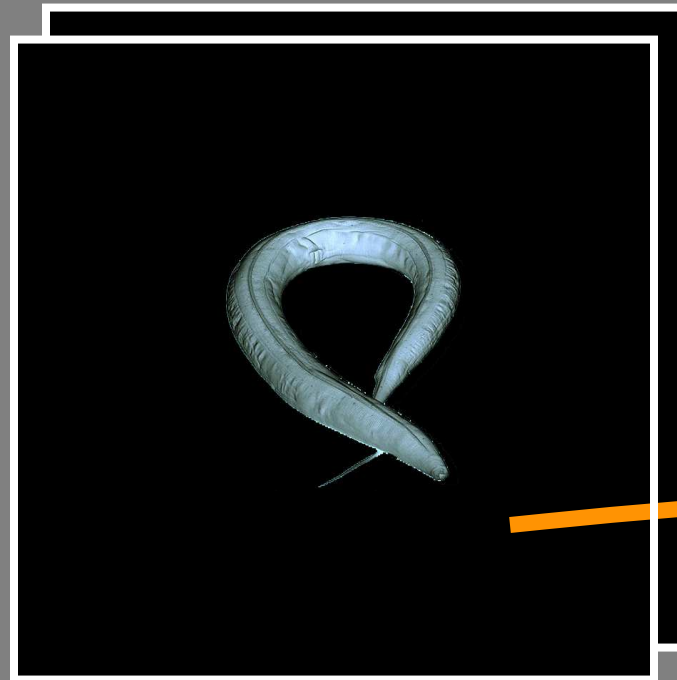
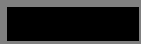
Single neuron level: the AFD neurons

(Mori and Ohshima, 1995)

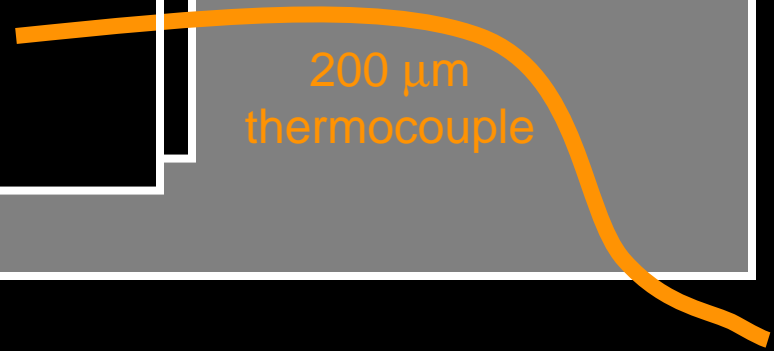


Single neuron level: Recording neural responses to temperature stimuli

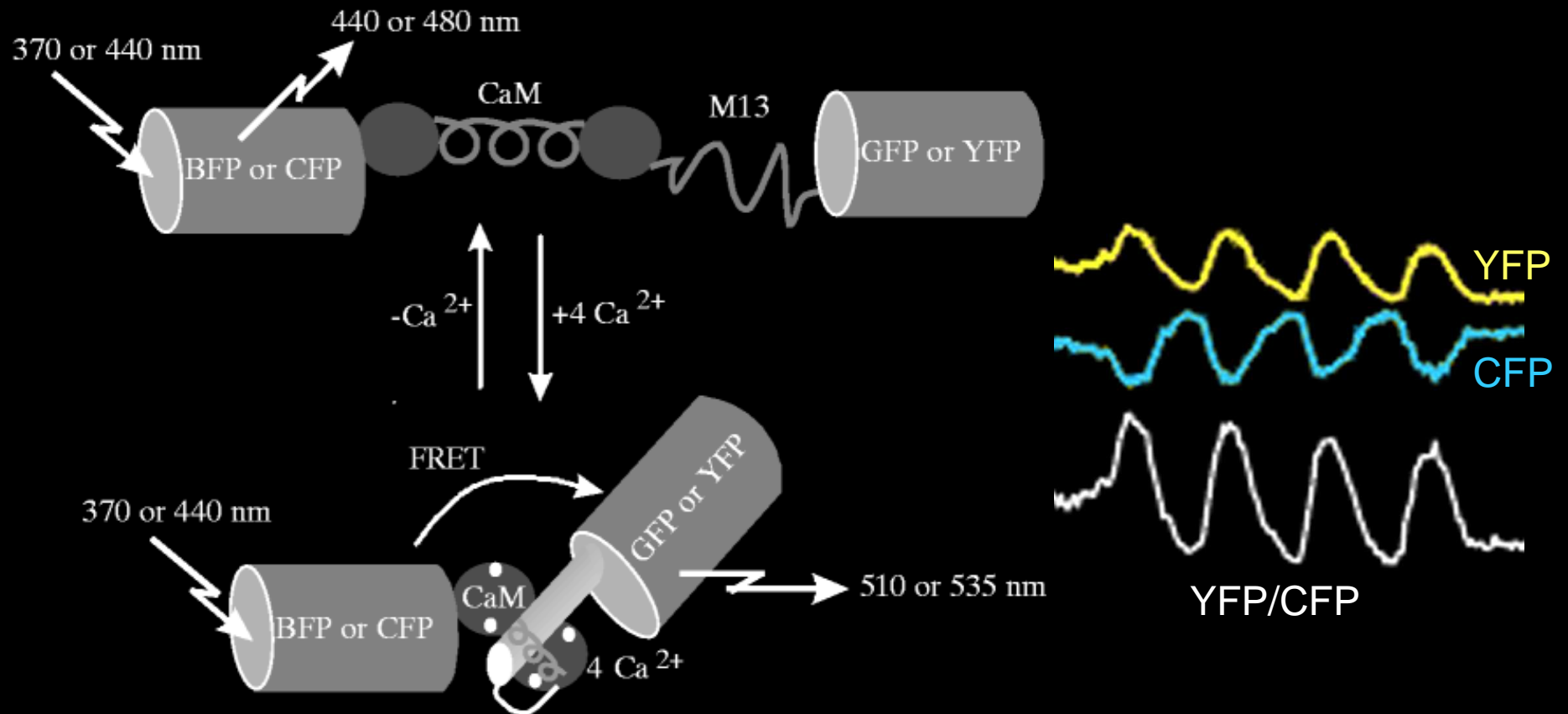
ITO covered
glass



200 μ m
thermocouple

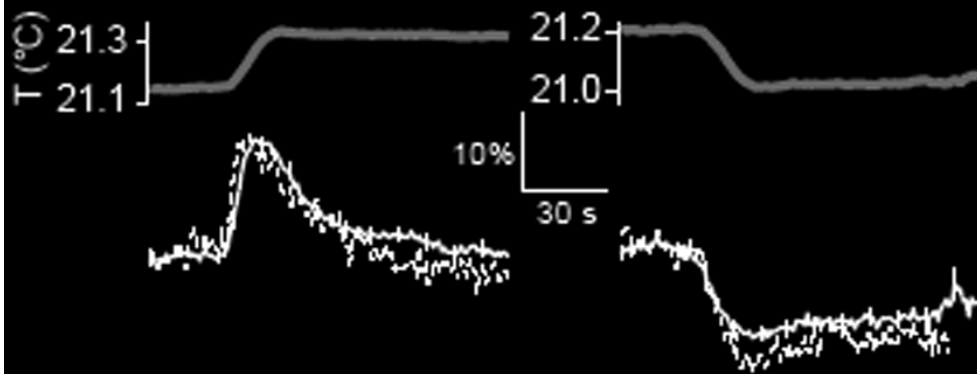


Cameleon is a FRET indicator for Ca^{2+}



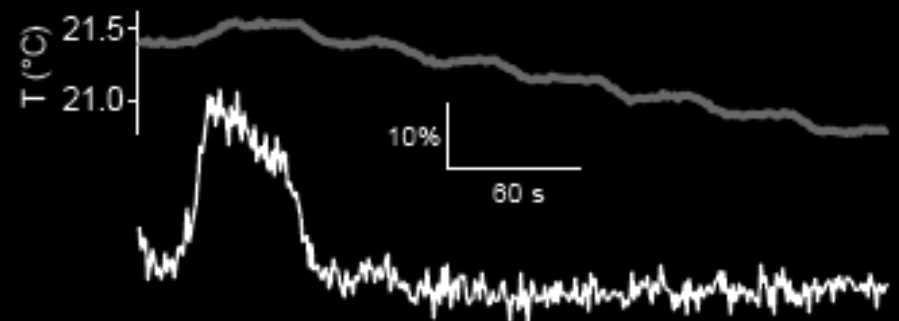
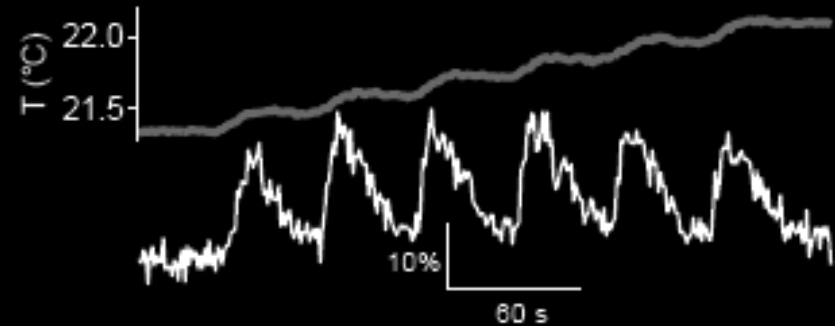
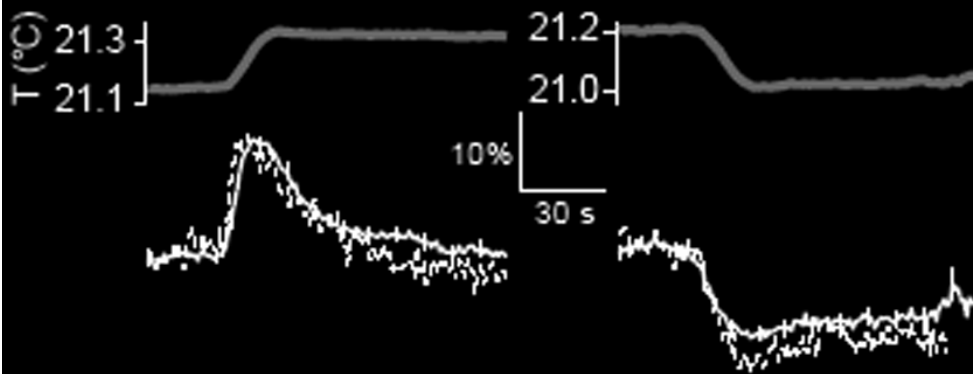
(Adapted from Miyawaki et al., 1997)

Above a threshold temperature Ca^{2+} dynamics in AFD respond to temperature stimuli



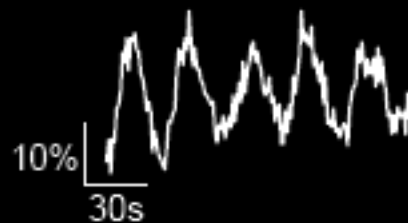
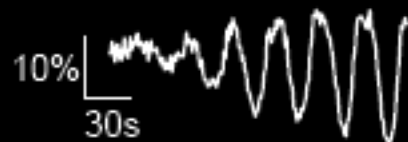
(see also Kimura et al.)

Above a threshold temperature Ca^{2+} dynamics in AFD respond to temperature stimuli

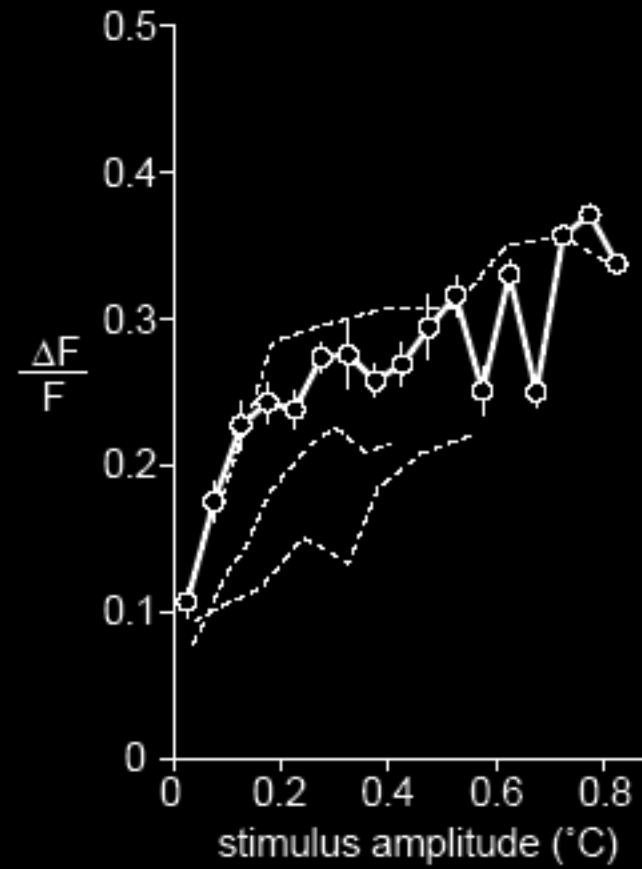
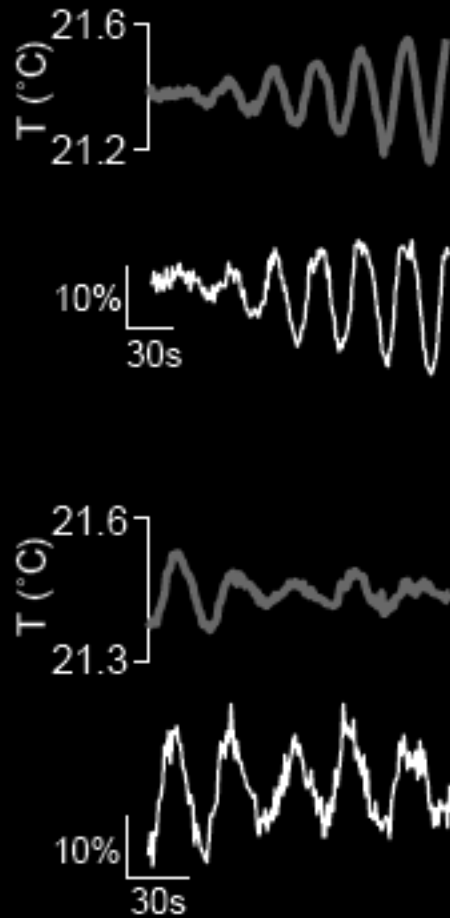


(see also Kimura et al.)

Ca²⁺ dynamics in AFD are sensitive to temperature oscillations between 0.05-0.5°C



Ca²⁺ dynamics in AFD are sensitive to temperature oscillations between 0.05-0.5°C





End (part 1)