

Motion Detection



Optomotor response in fly

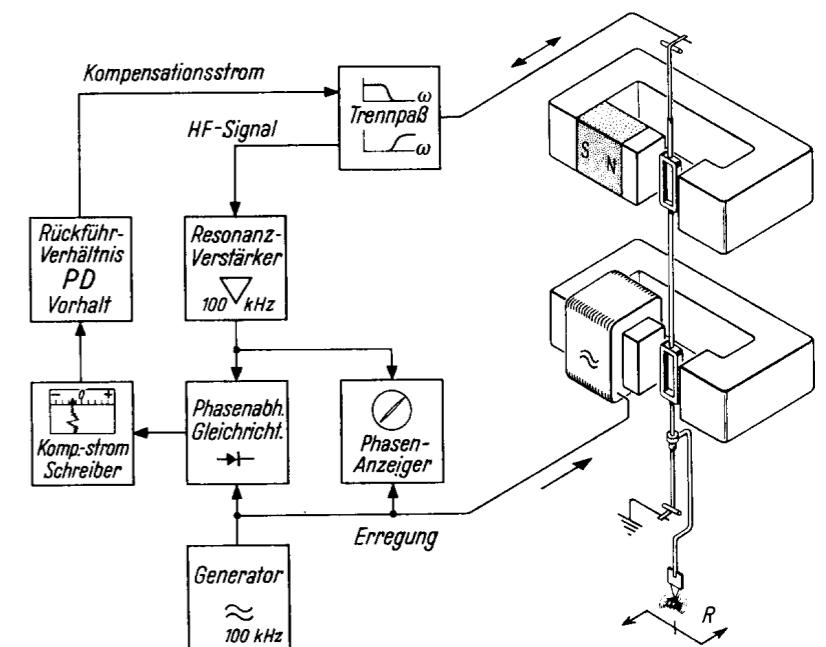
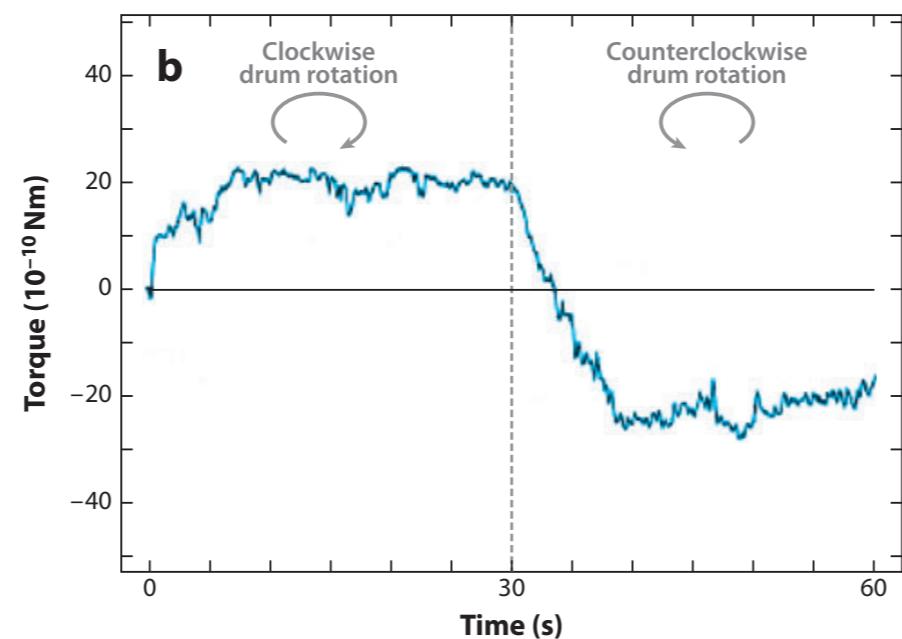
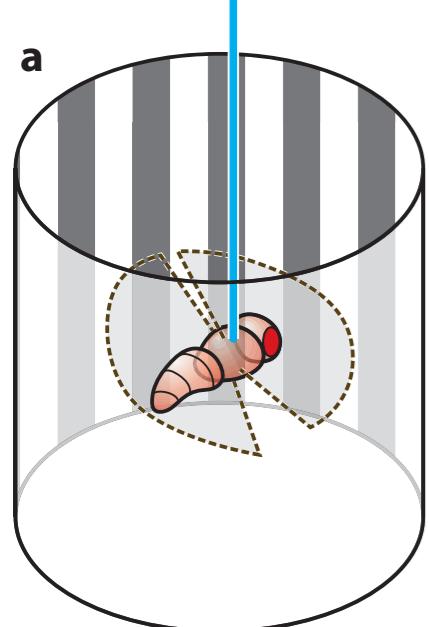
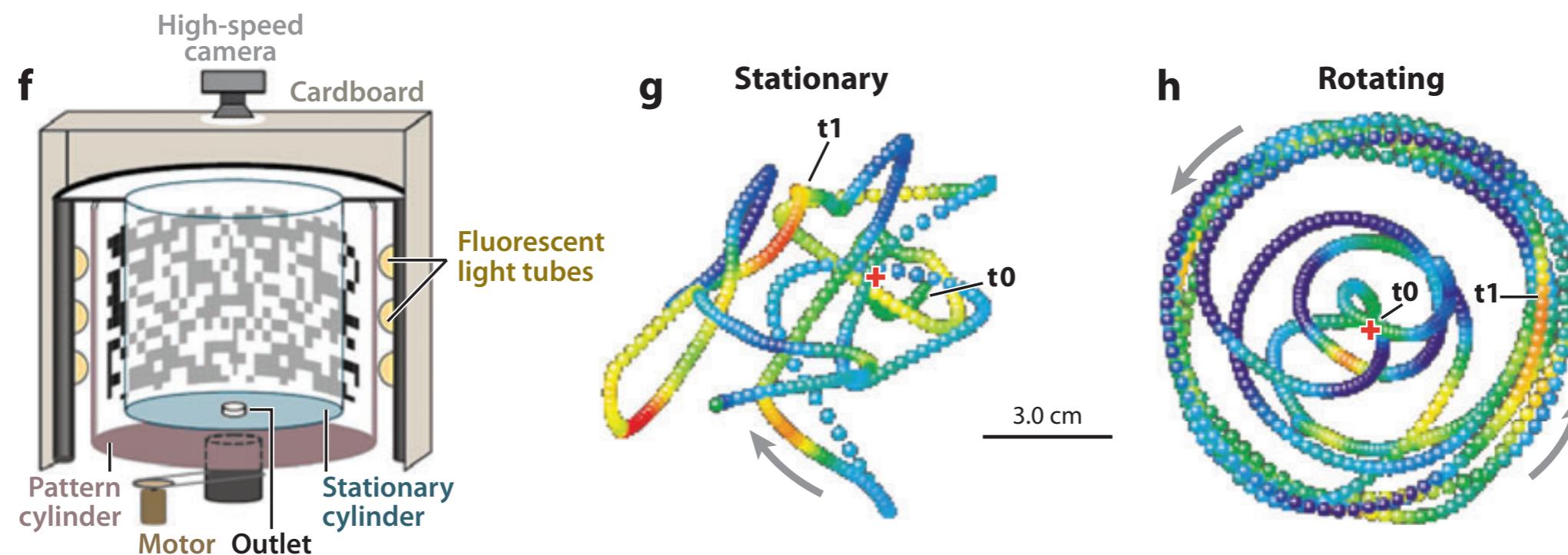
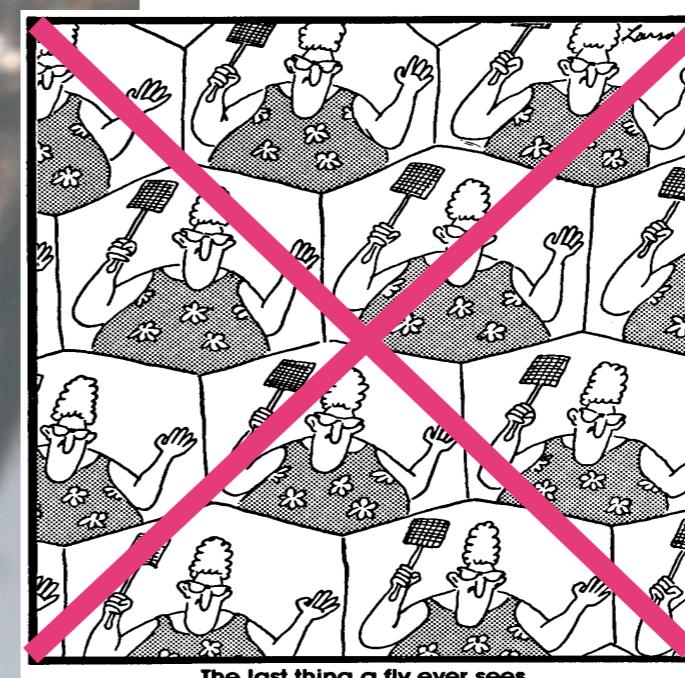
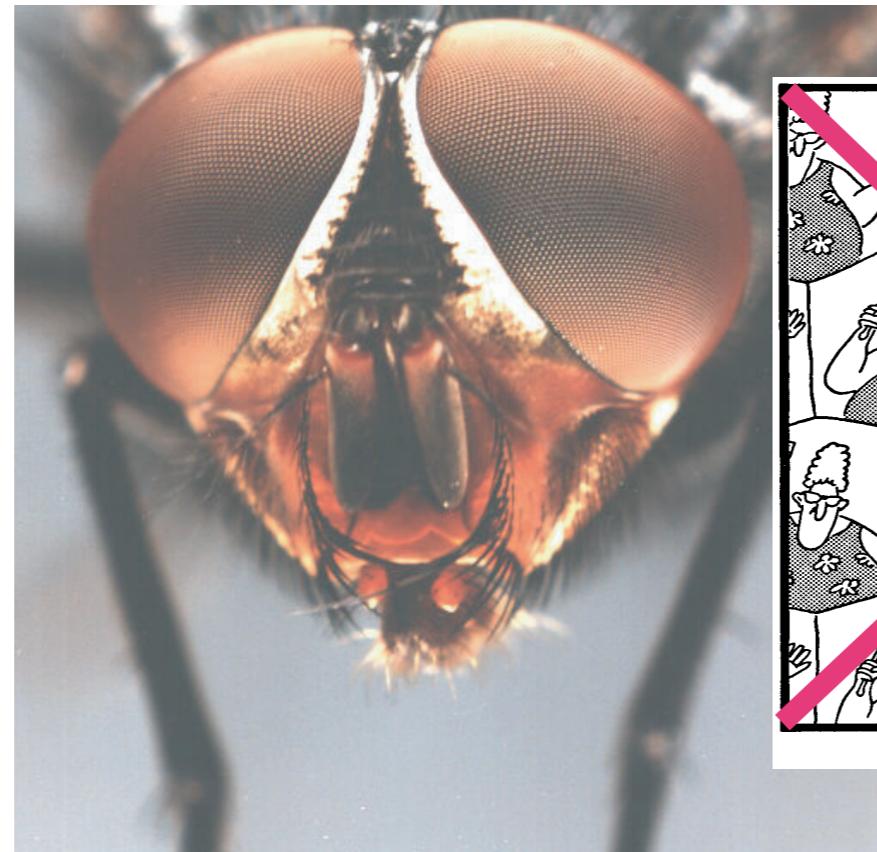


Abb. 3. Blockdiagramm des Drehmomentkompensators zur quantitativen Registrierung der Wendereaktionen fixierter fliegender Drosophilae (vgl. Text)

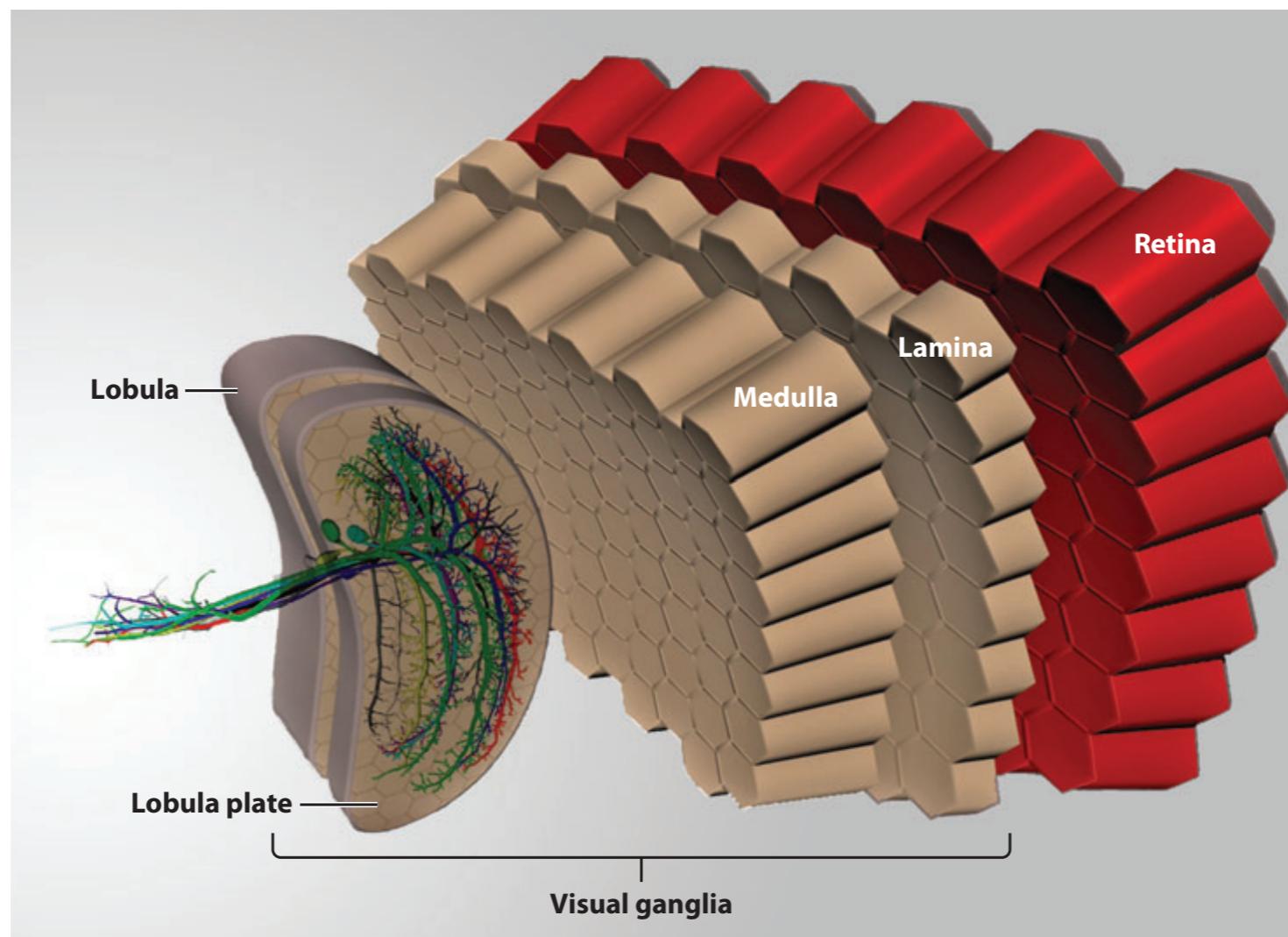
Optomotor response in fly



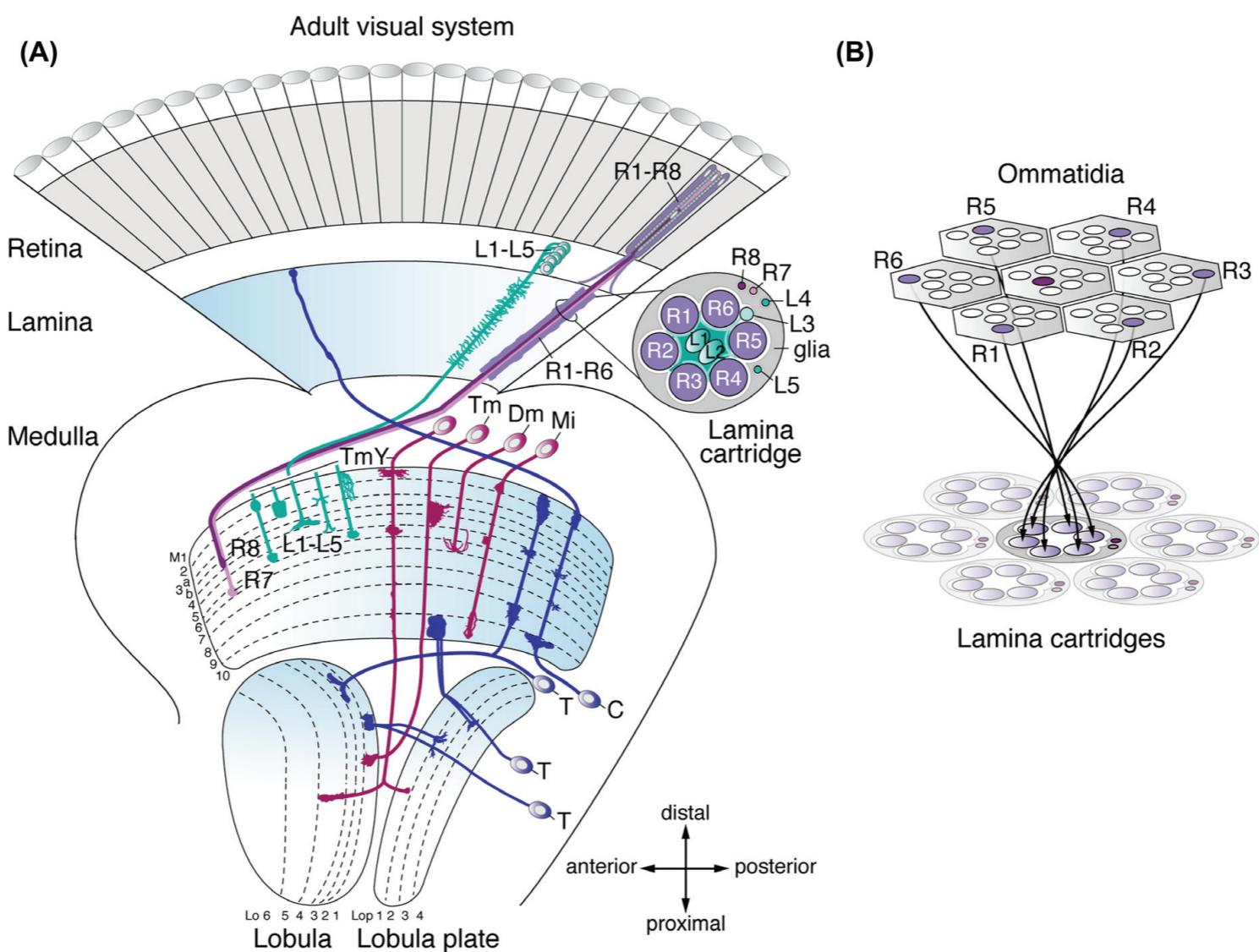
The Fly Visual System



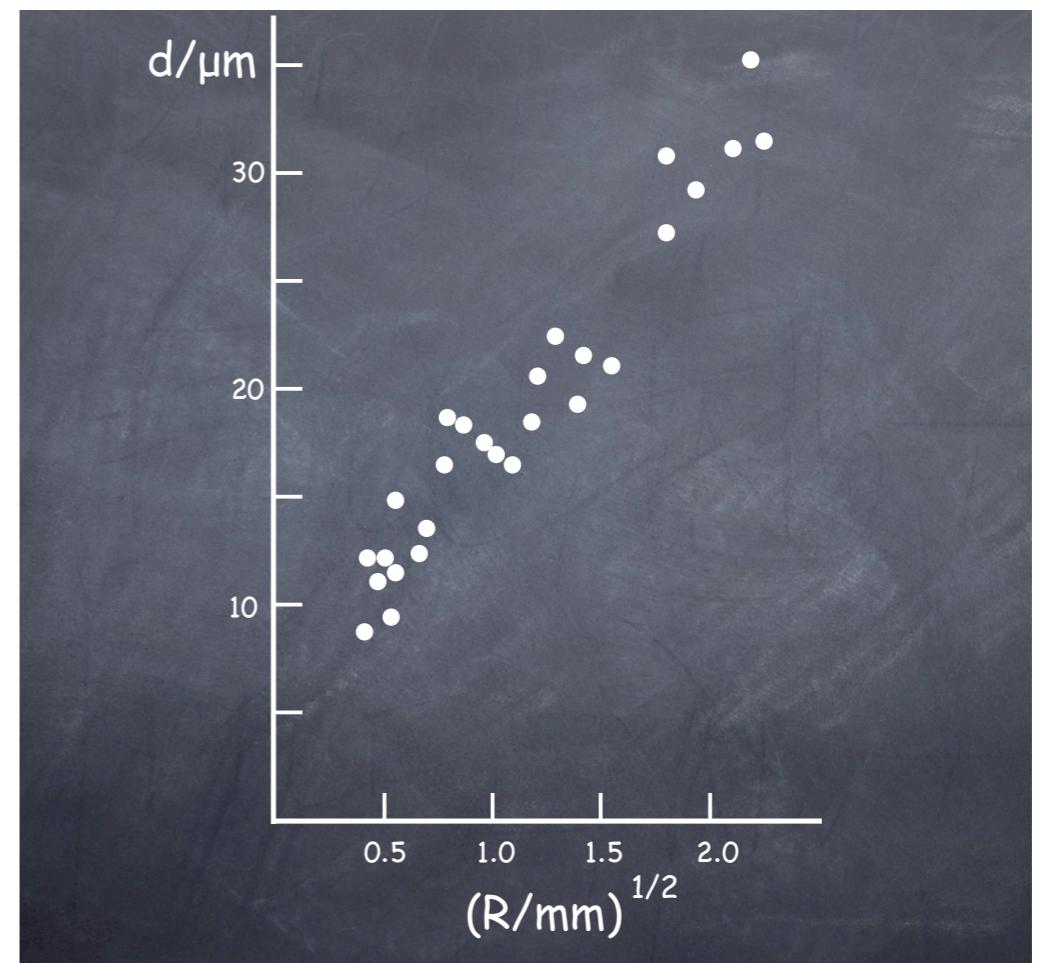
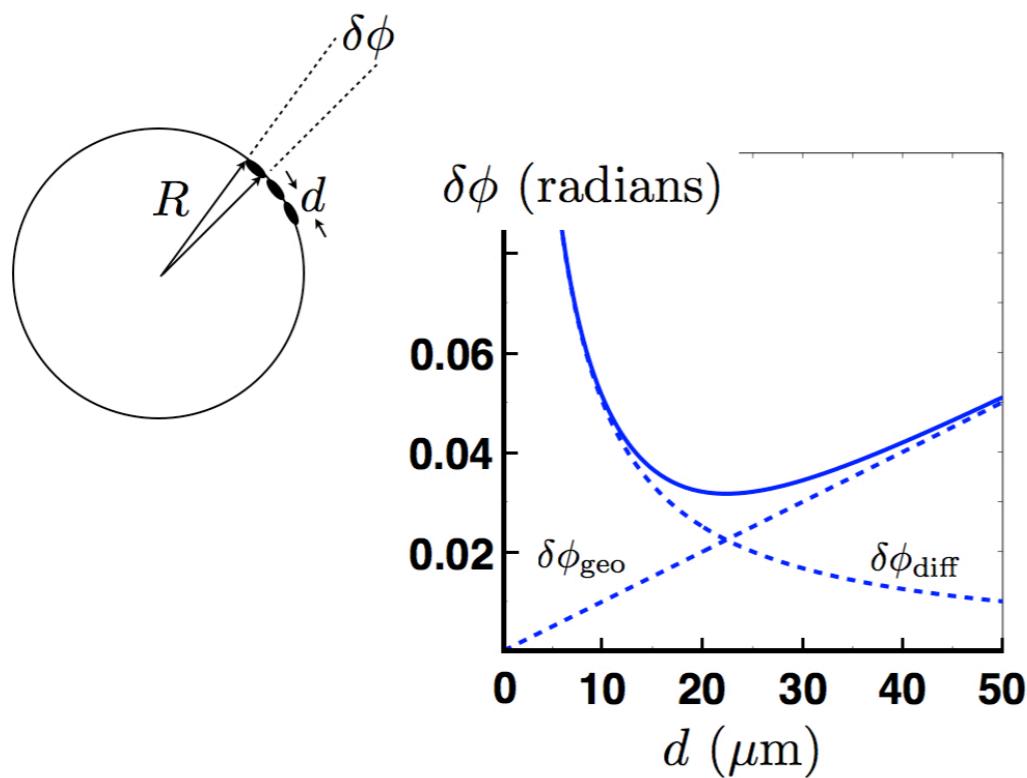
The Fly Visual System



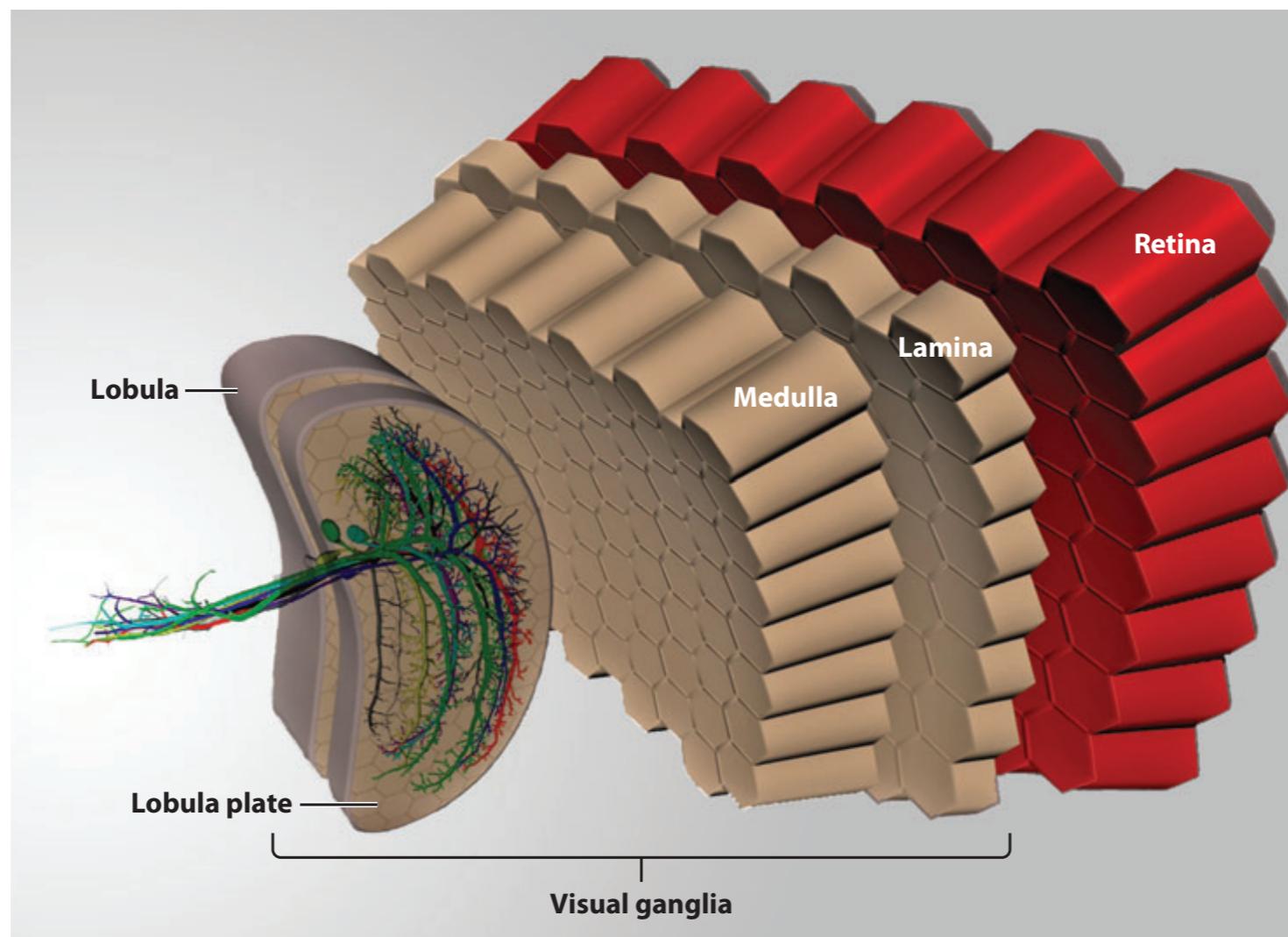
The Fly Visual System



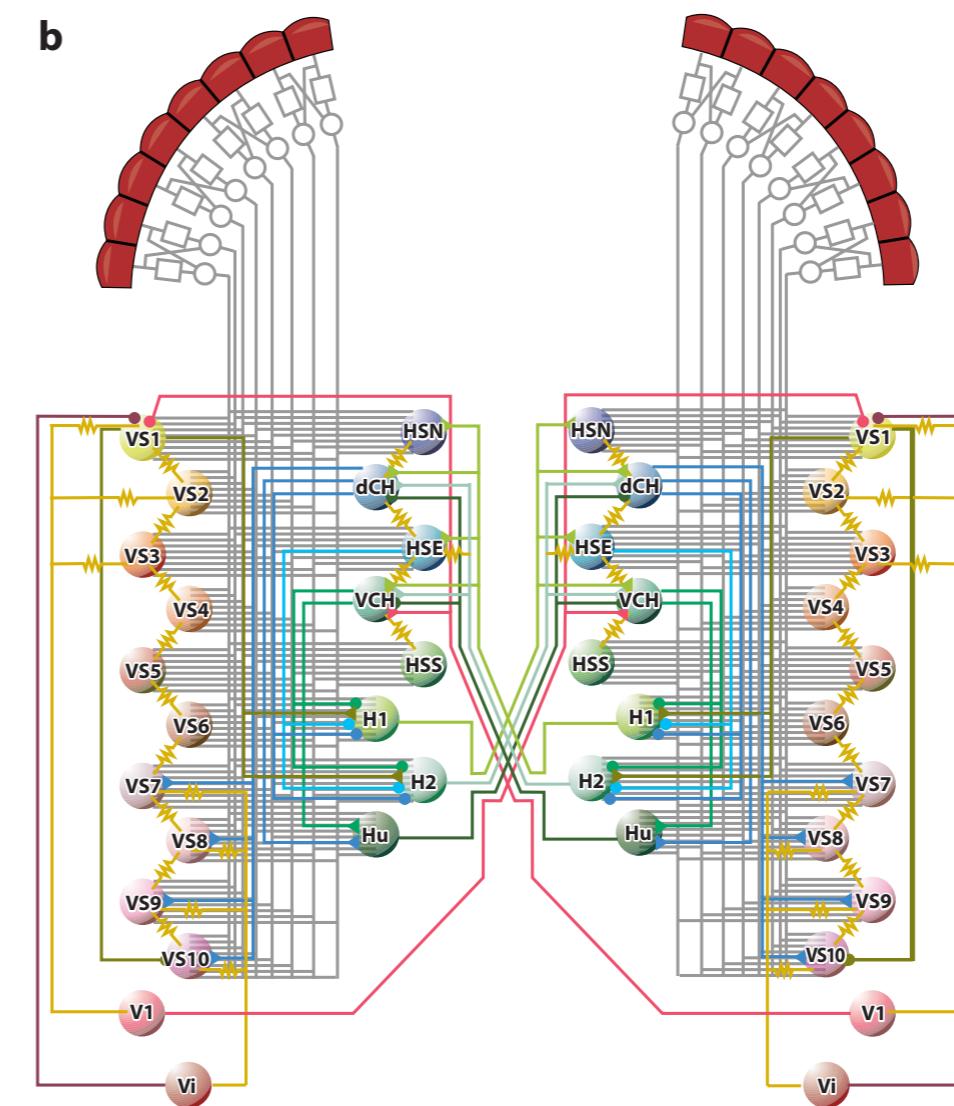
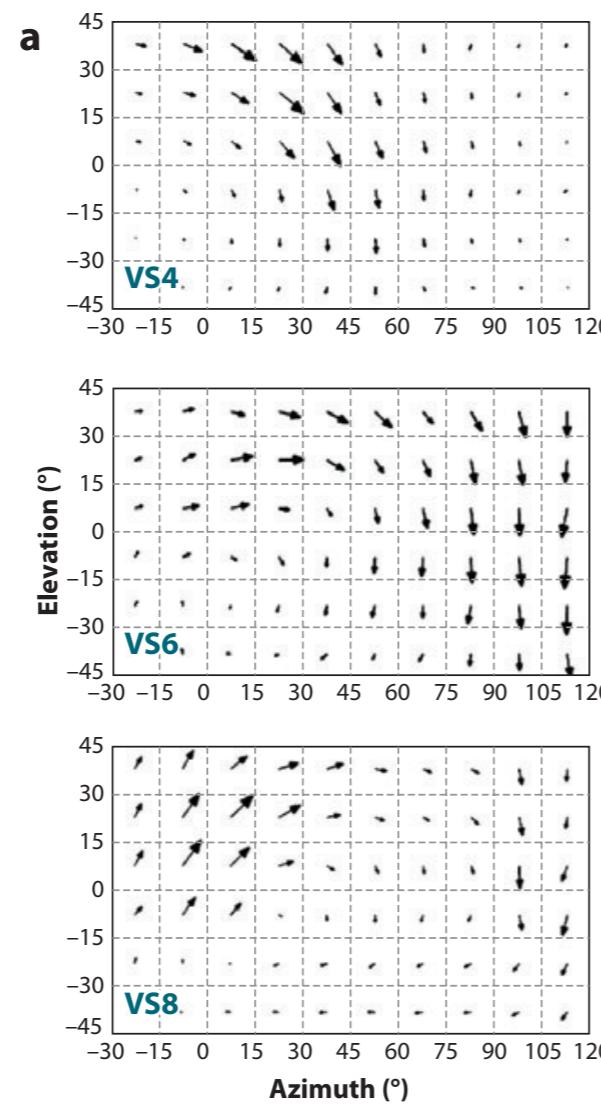
The Fly Visual System



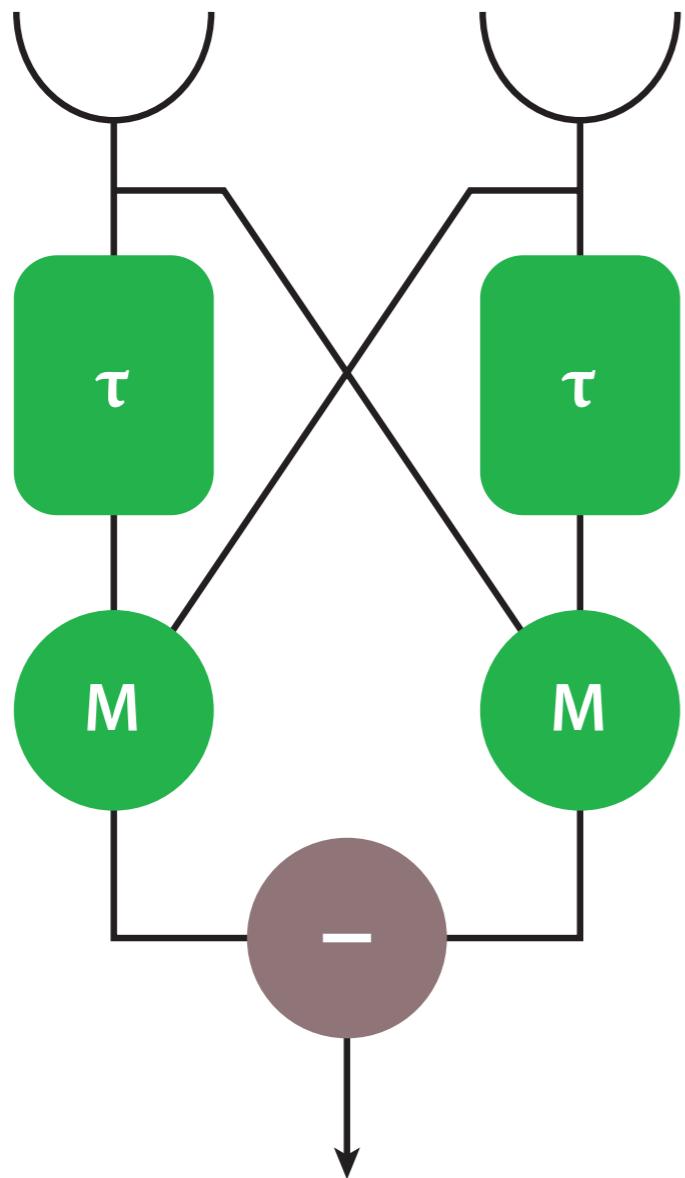
The Fly Visual System



Motion-Selective Cells in Fly



Hassenstein-Reichardt Detector Model

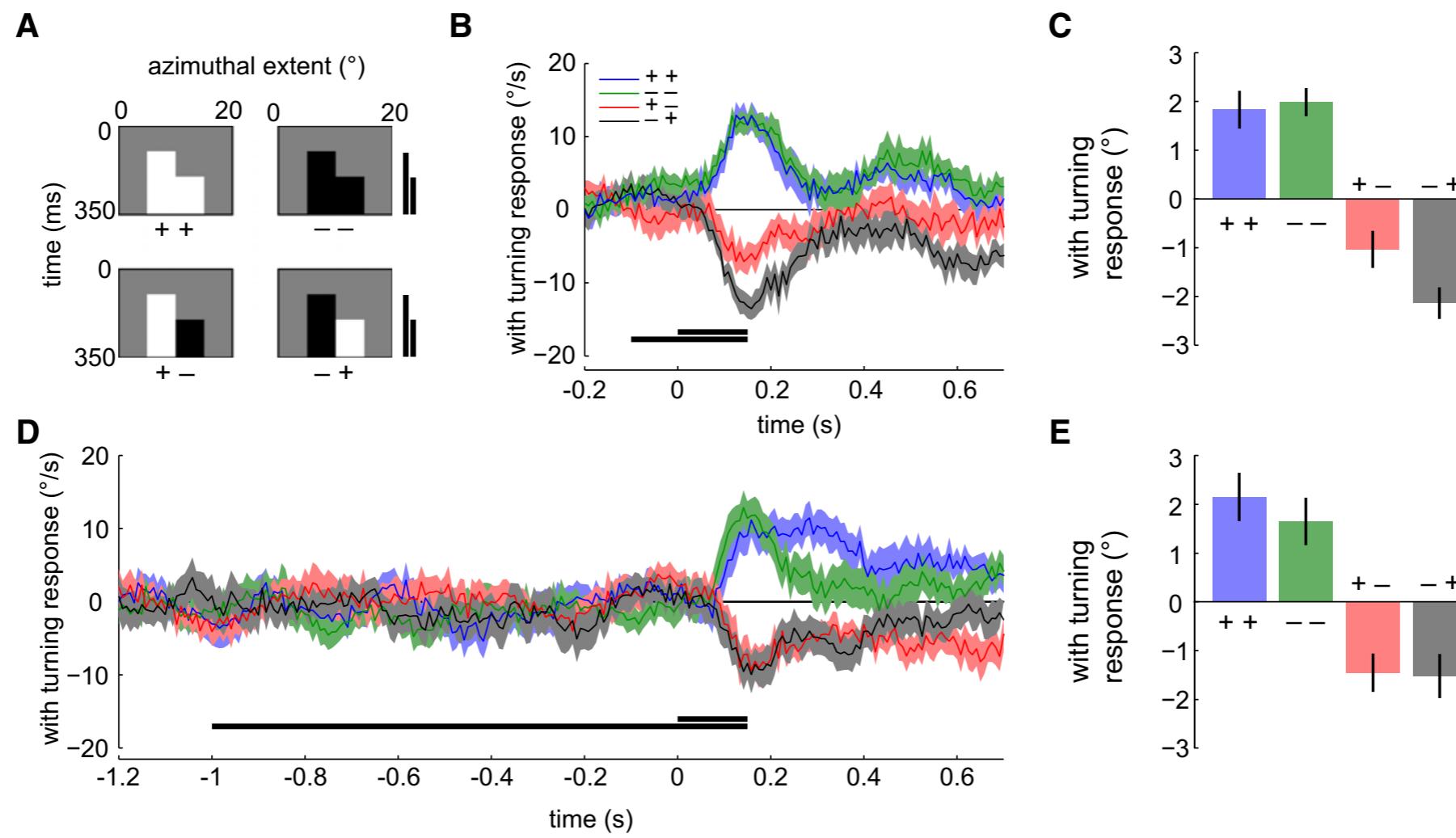


Werner Reichardt

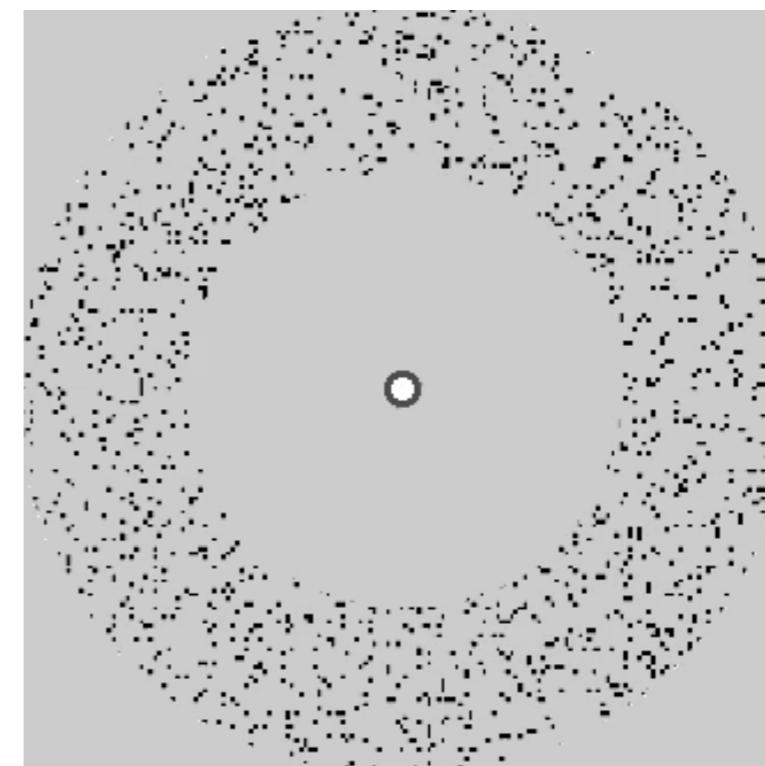
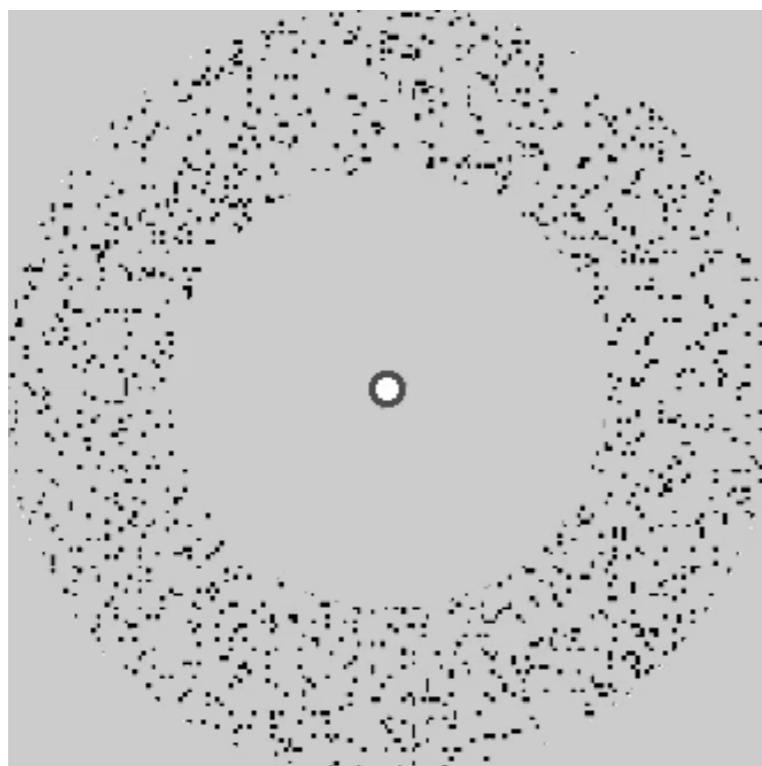
Phi and Reverse Phi motion detection in Fly



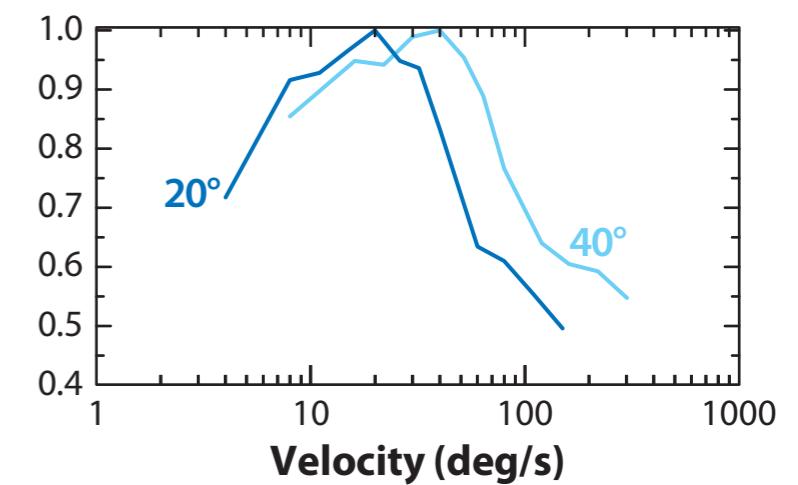
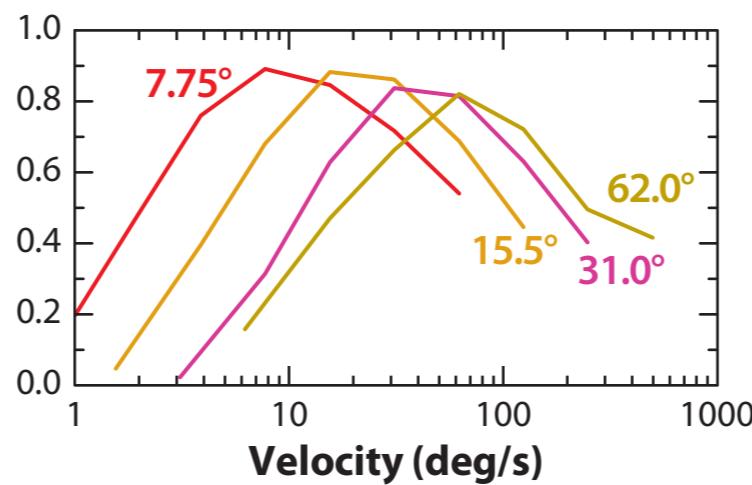
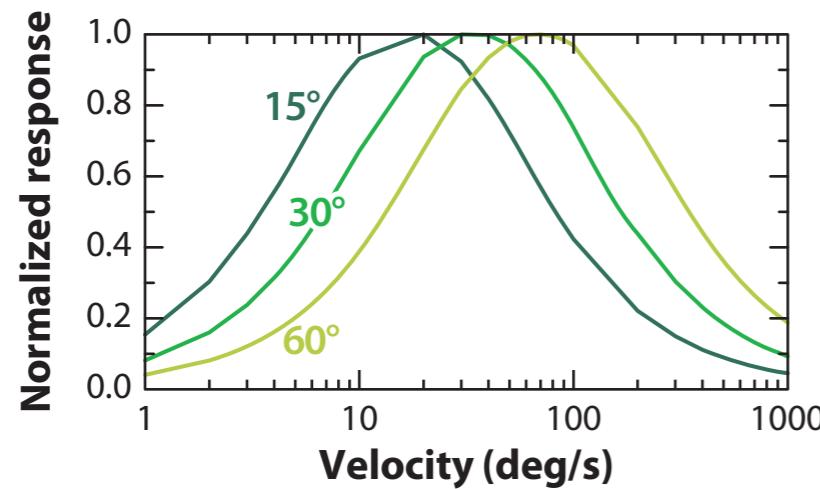
Phi and Reverse Phi motion detection in Fly



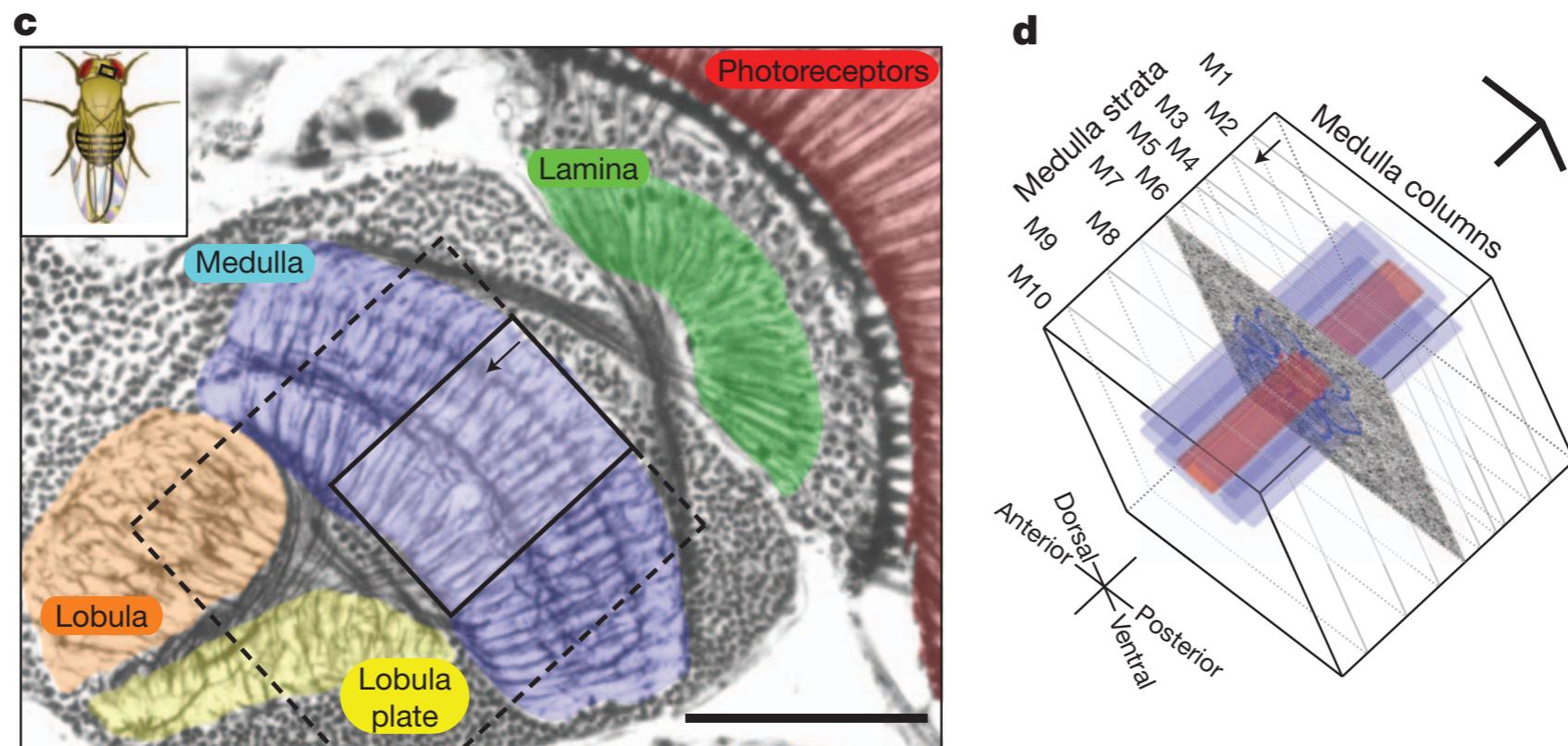
Phi and Reverse Phi motion detection in Human



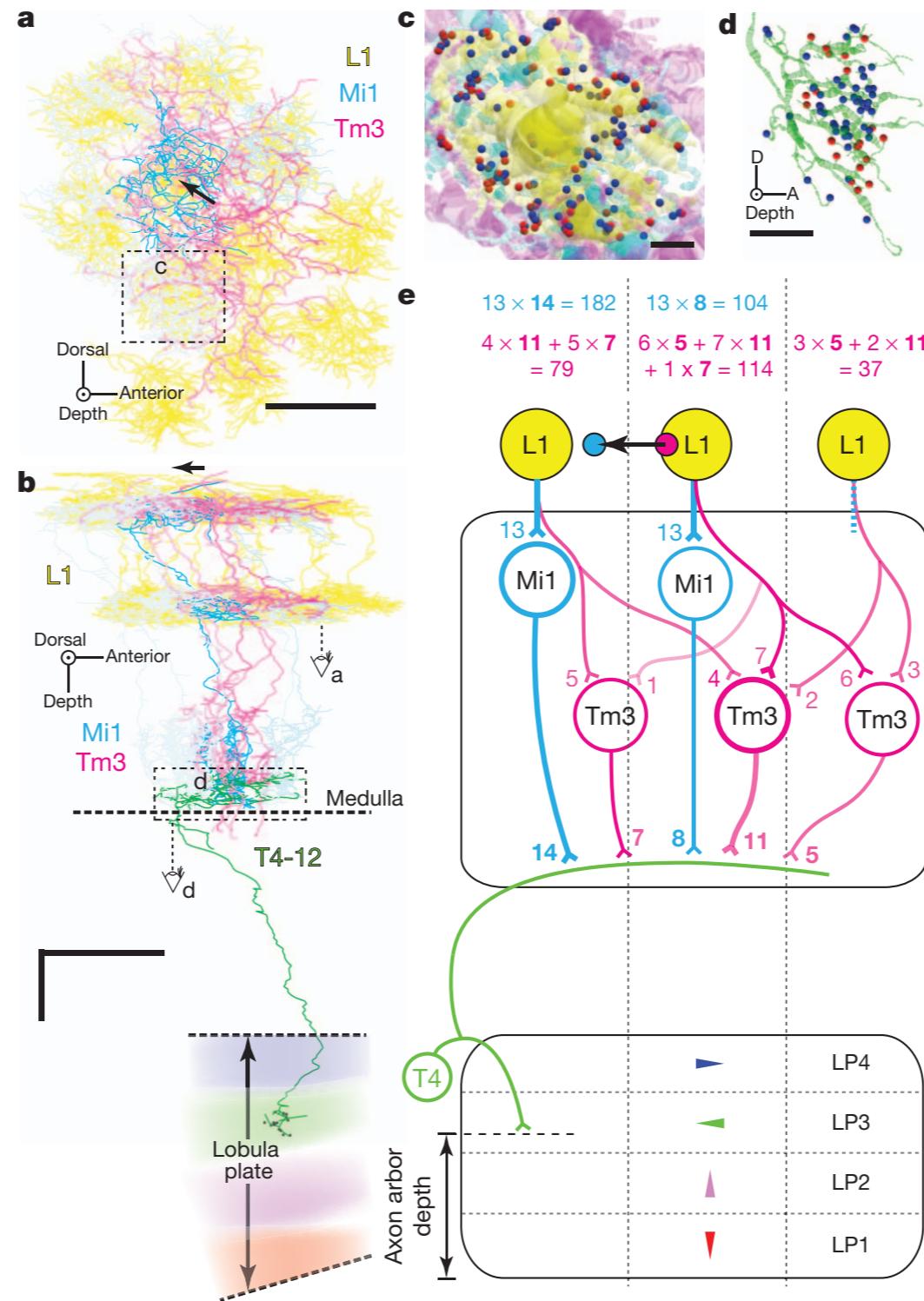
Optimal response depends on both grading velocity
and spatial wavelength of the grading



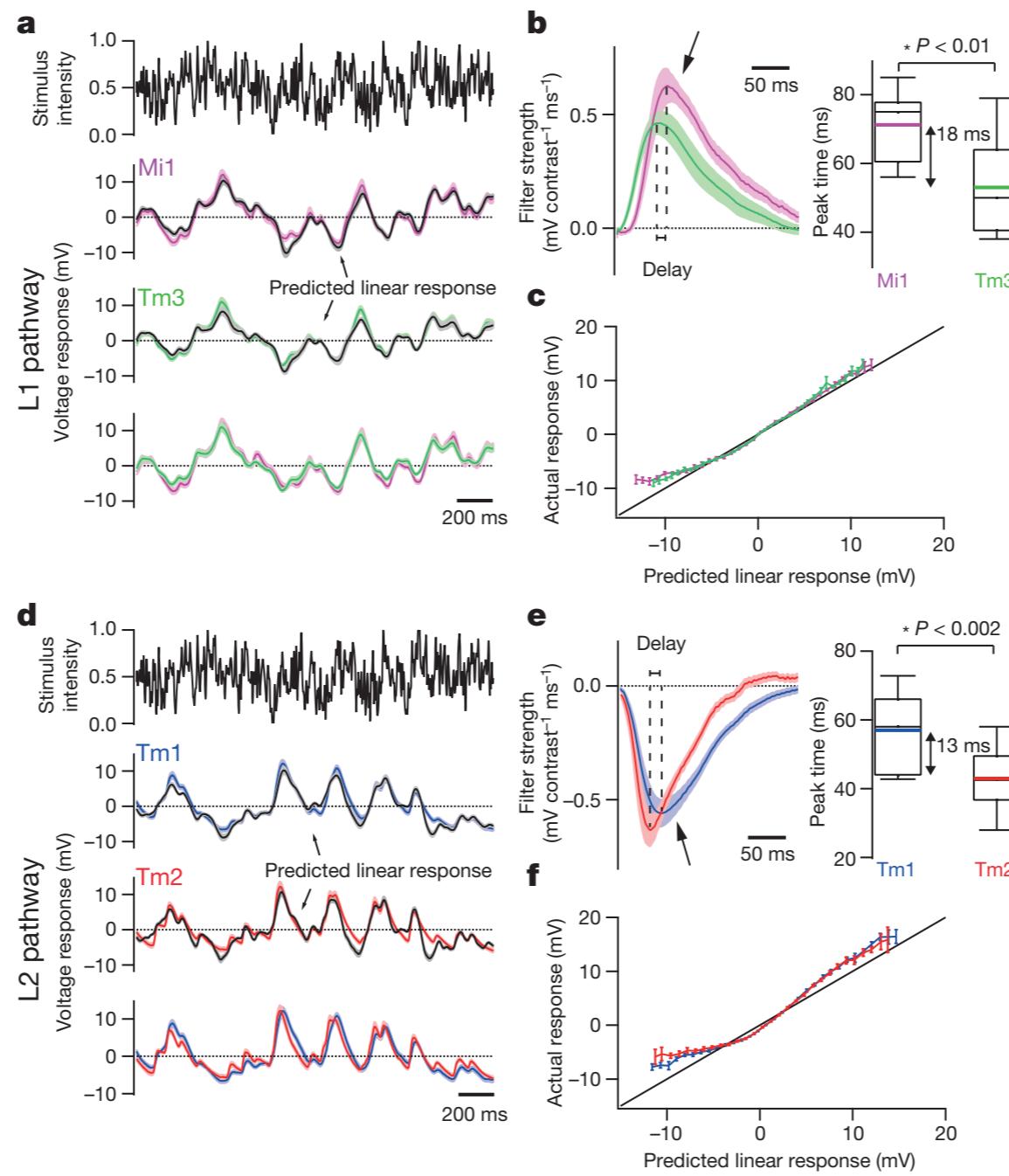
On-going activity in testing the model

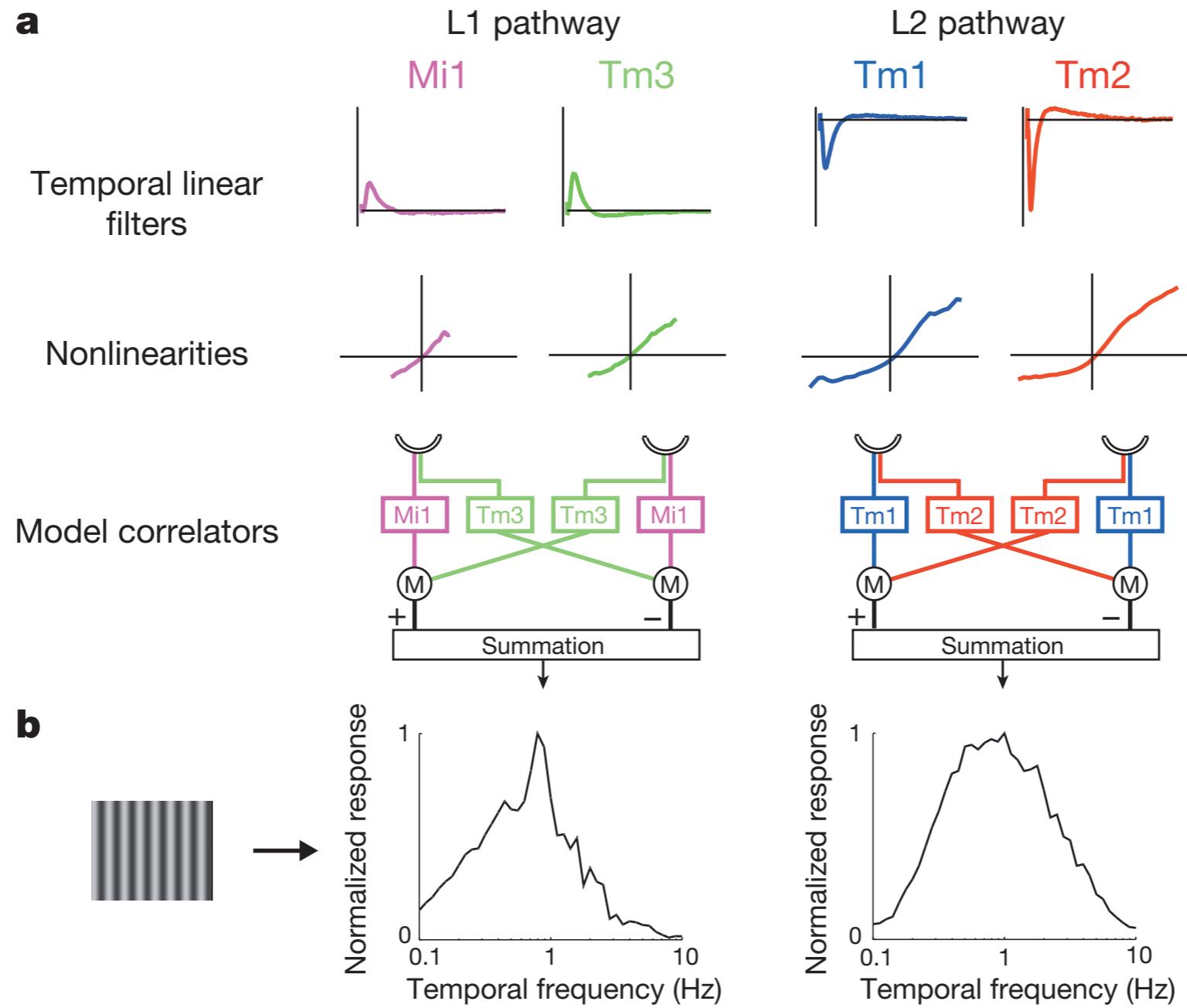


On-going activity in testing the model

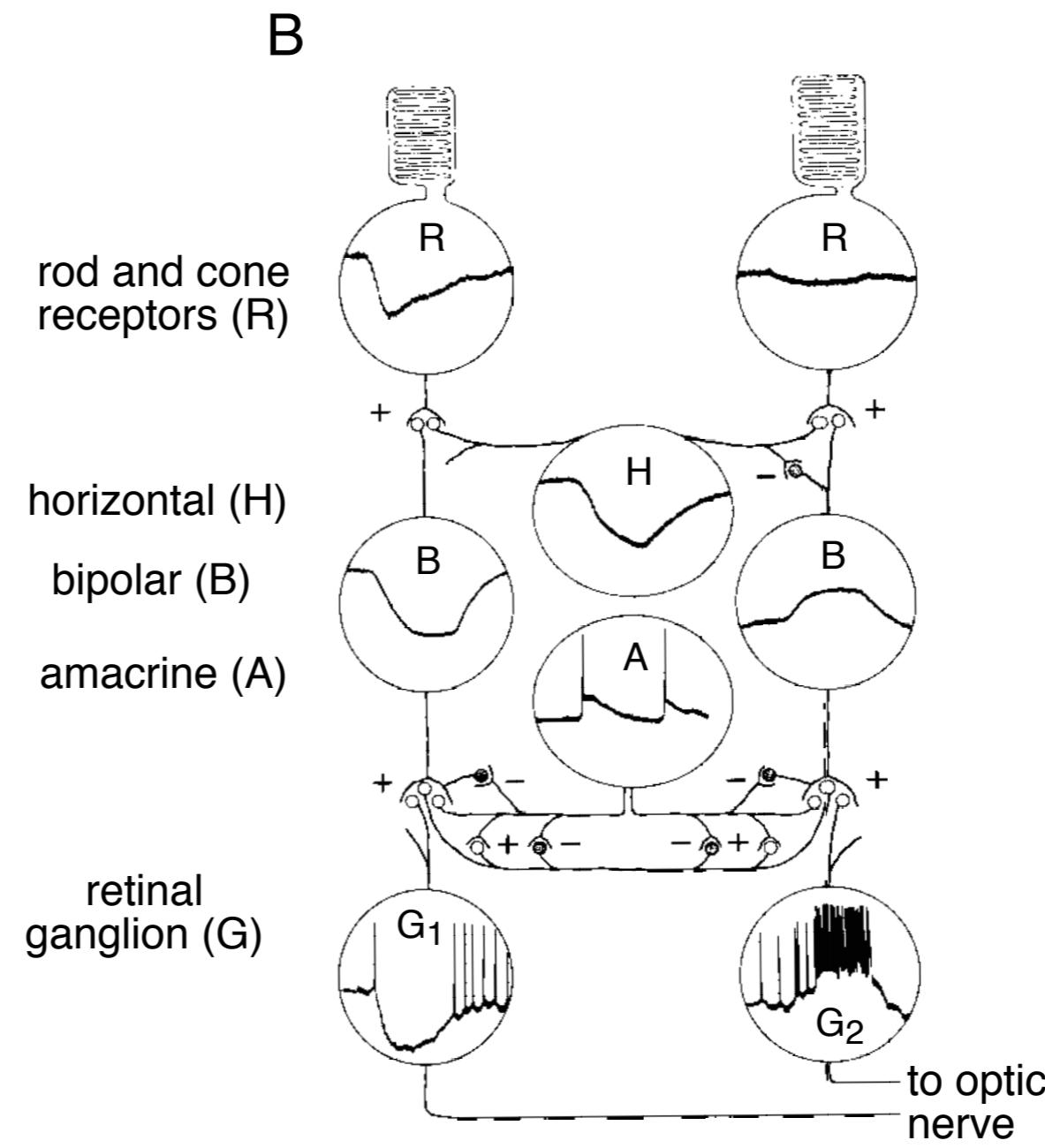
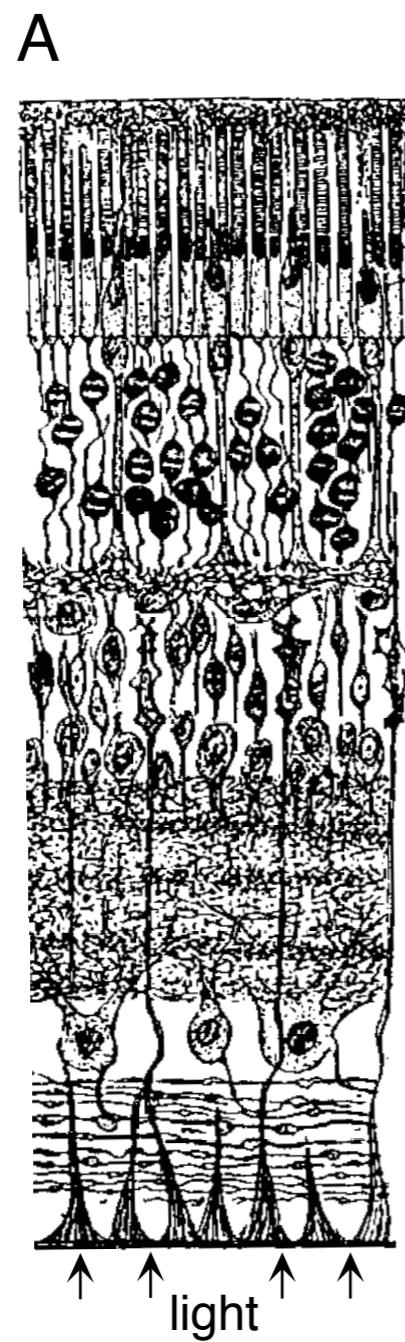


On-going activity in testing the model

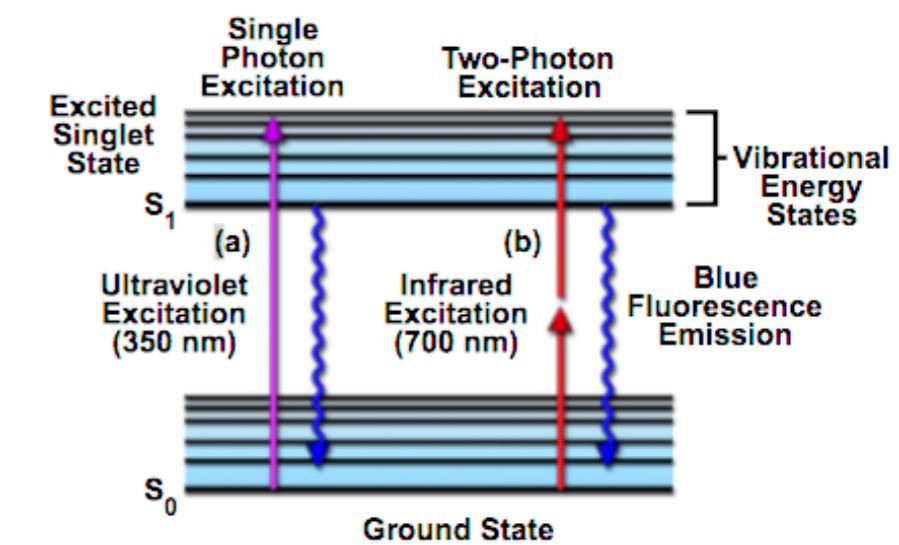
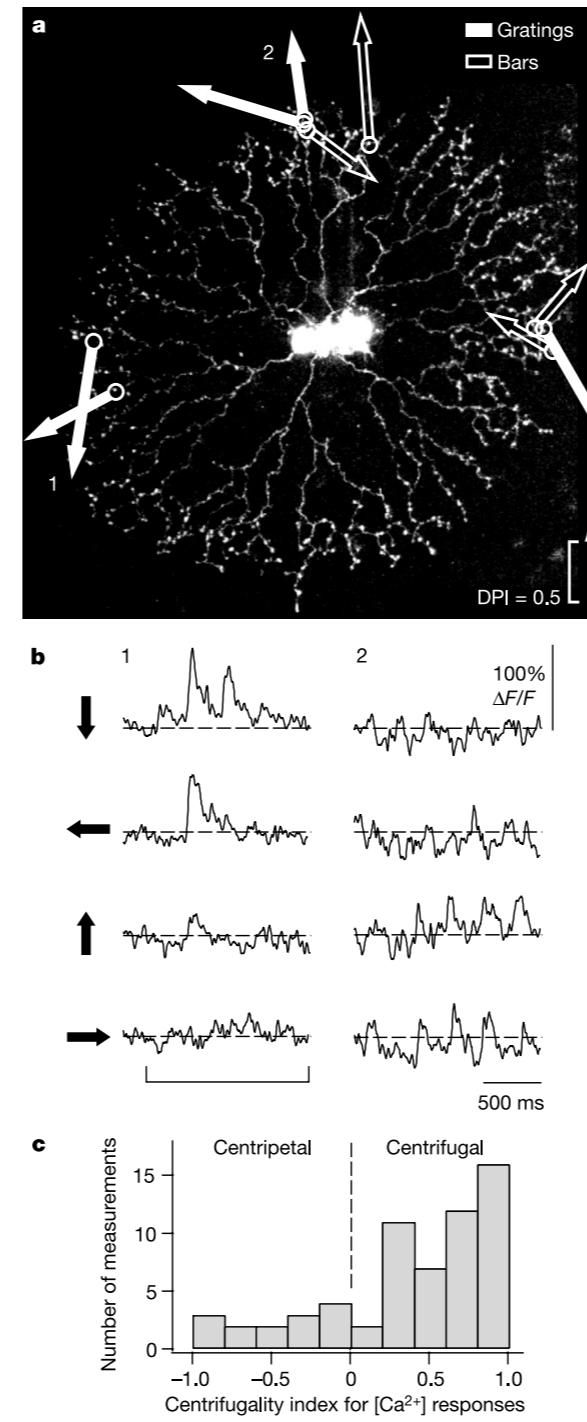
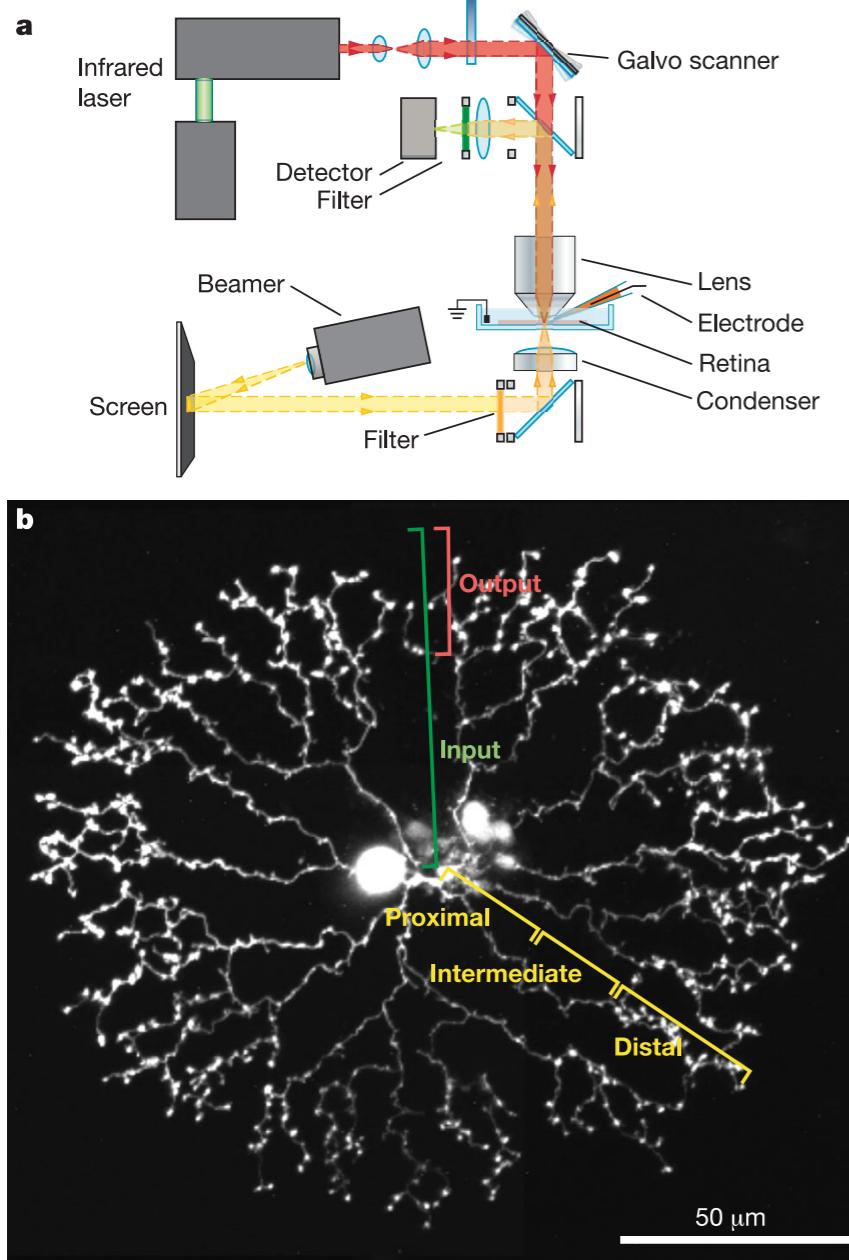




Motion detection in mammalian retina

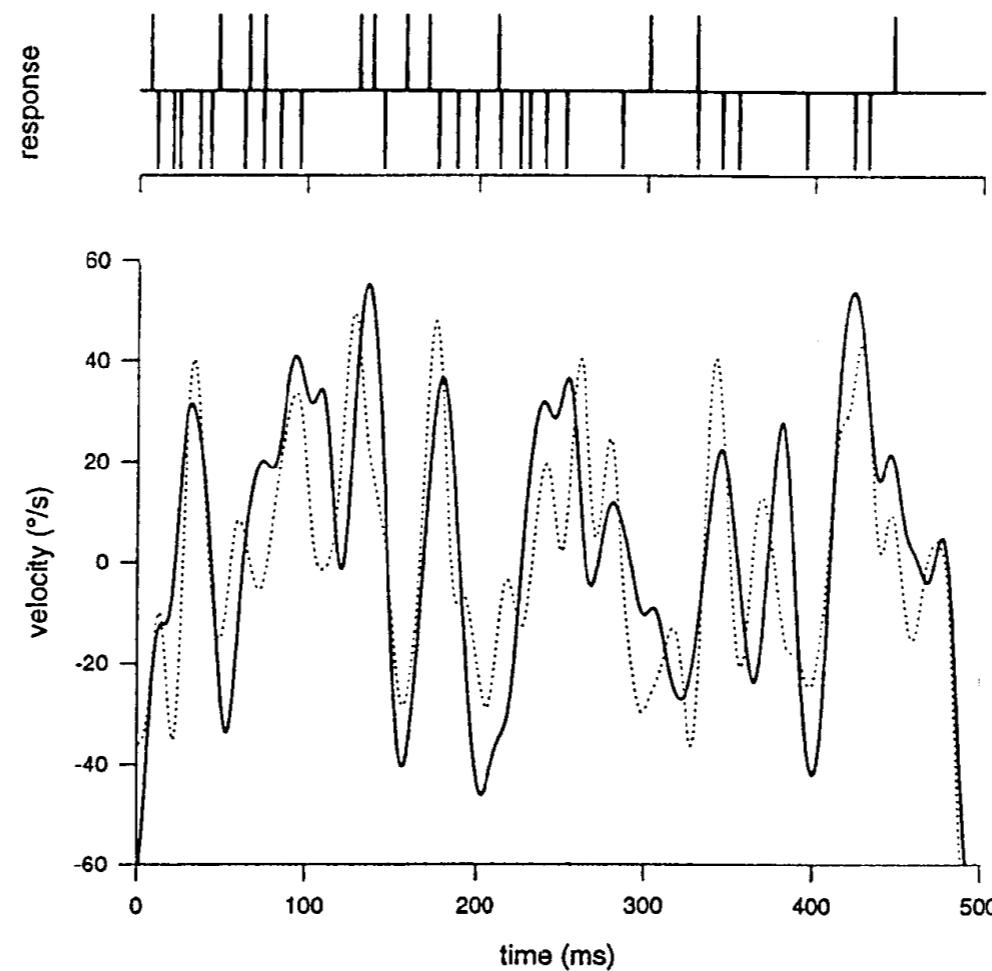


Direction-selective starburst amacrine cell



**How can the brain make sense of
the neural code?**

The decoding problem



Fly HI neuron that responds to motion stimuli

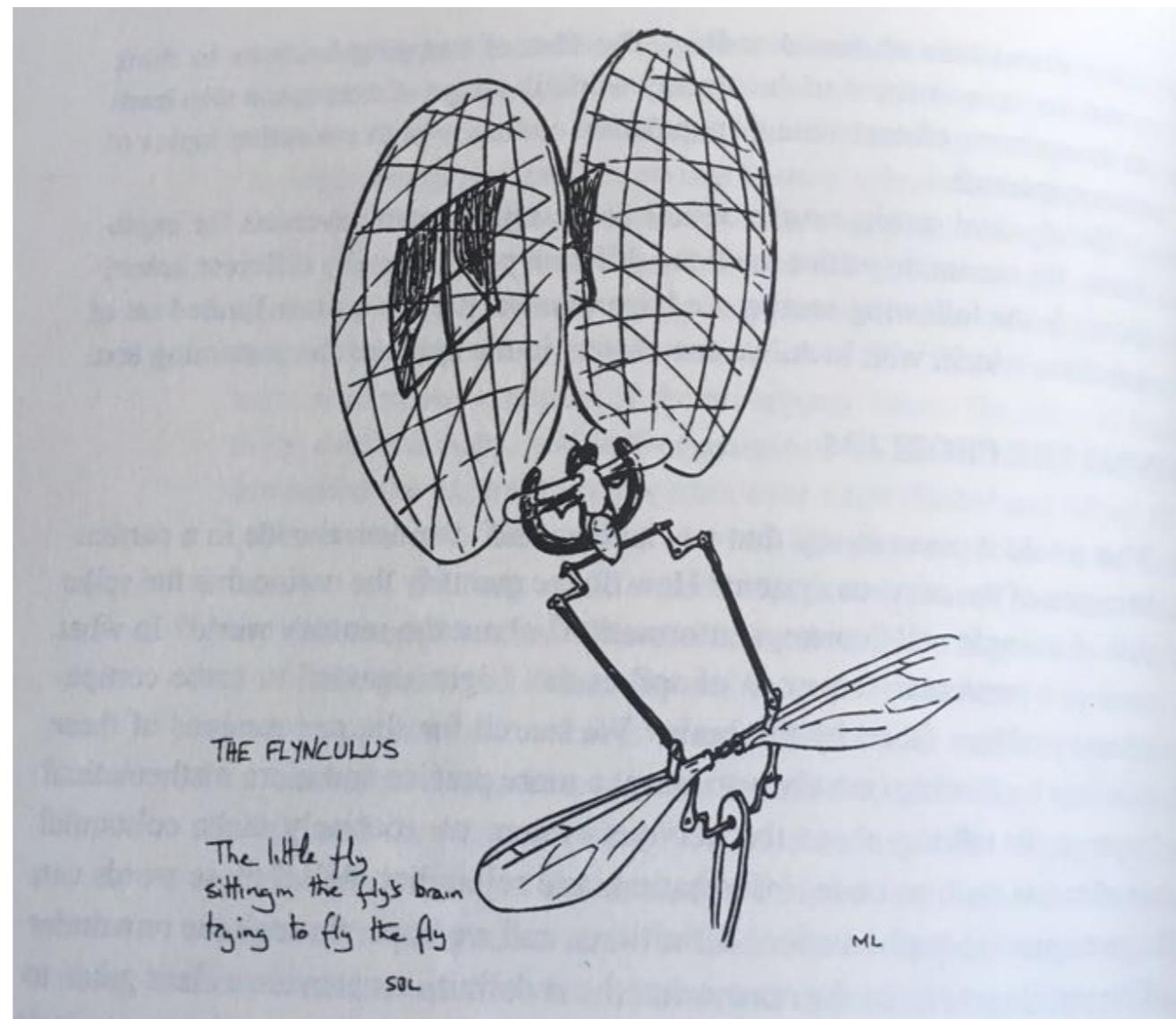
Homunculus

a very small human or humanoid creature.

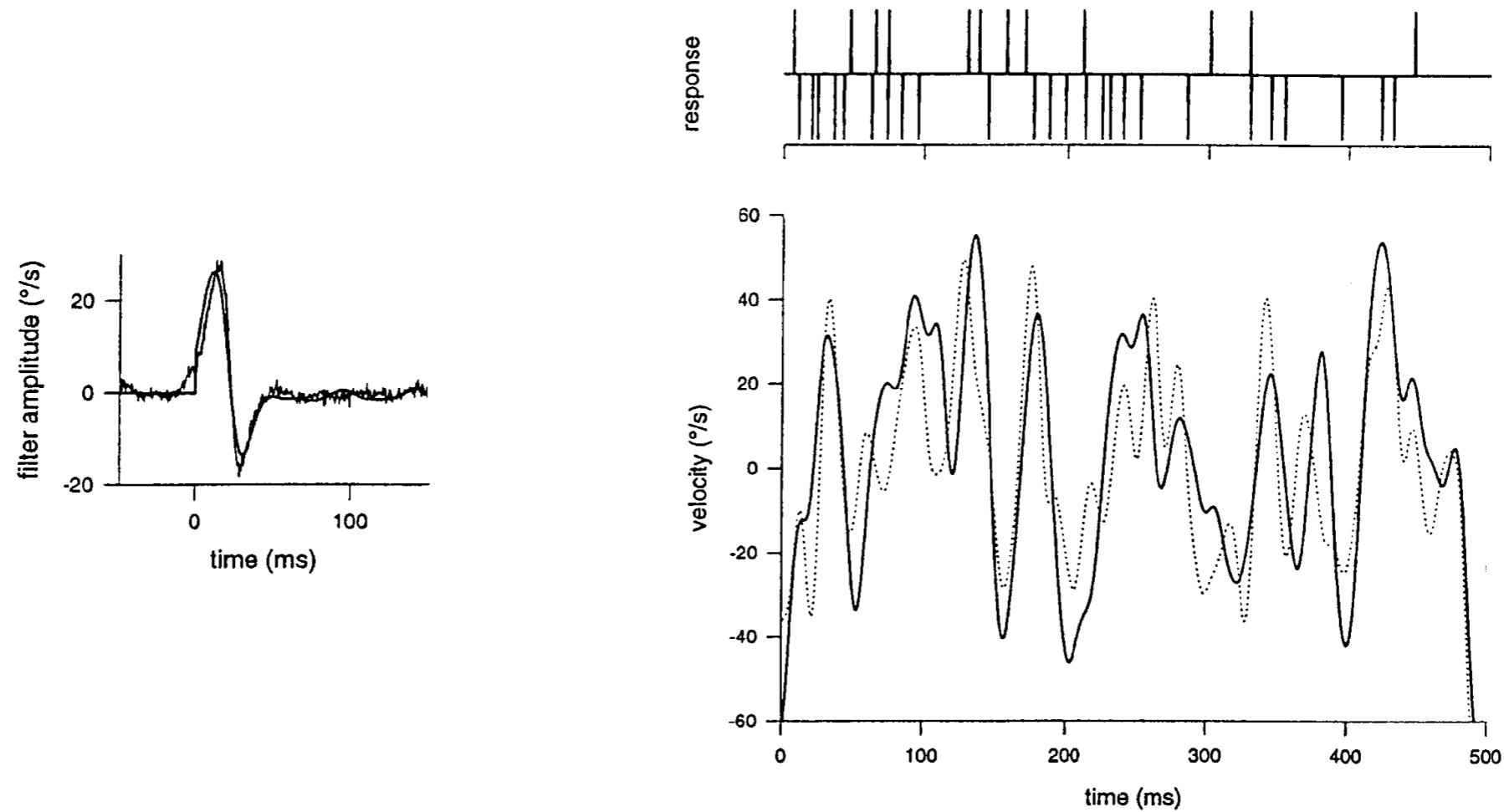
- *historical* a supposed microscopic but fully formed human being from which a fetus was formerly believed to develop.

Flynculus

The little fly sitting in the fly's brain trying to fly the fly

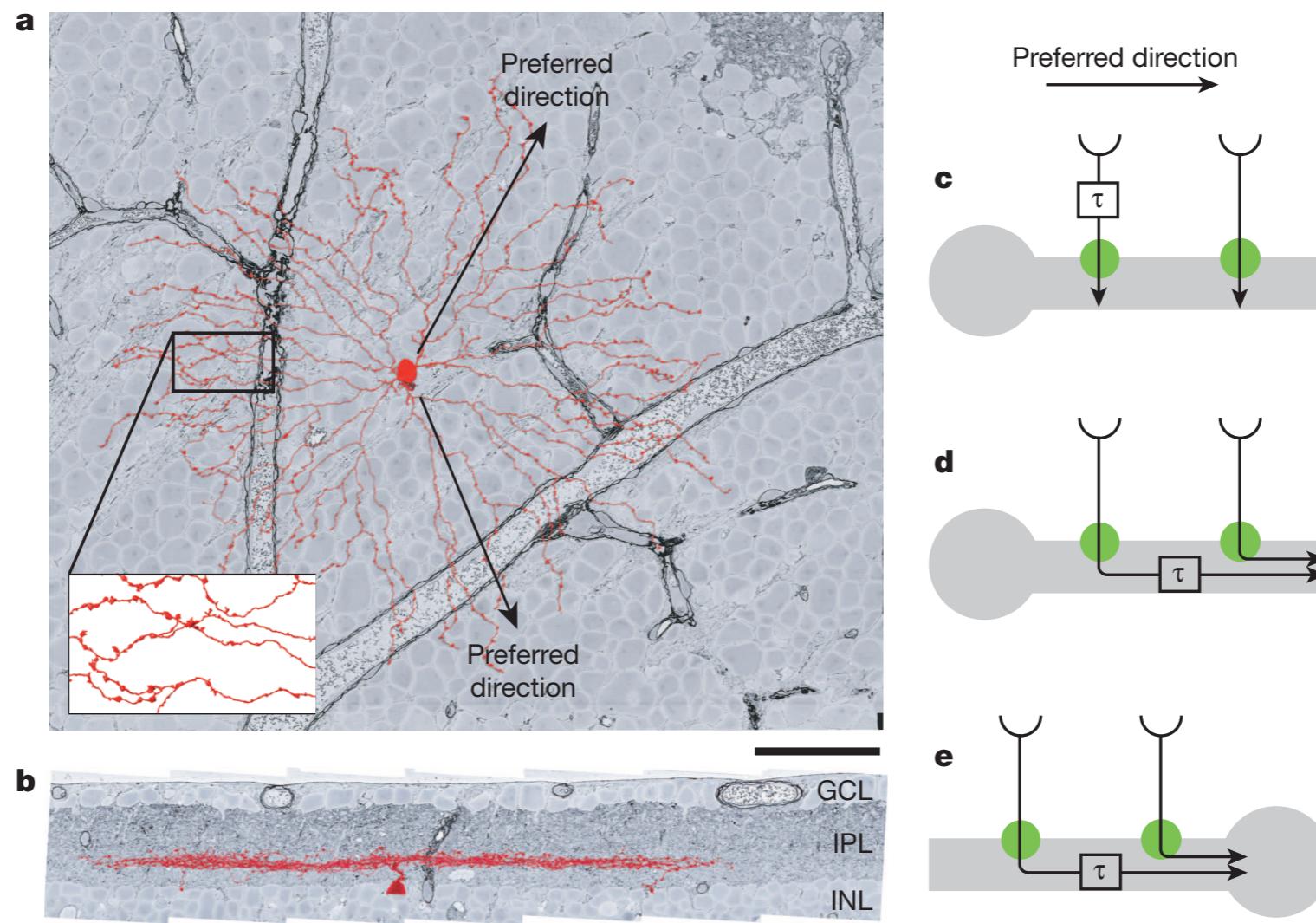


The decoding problem

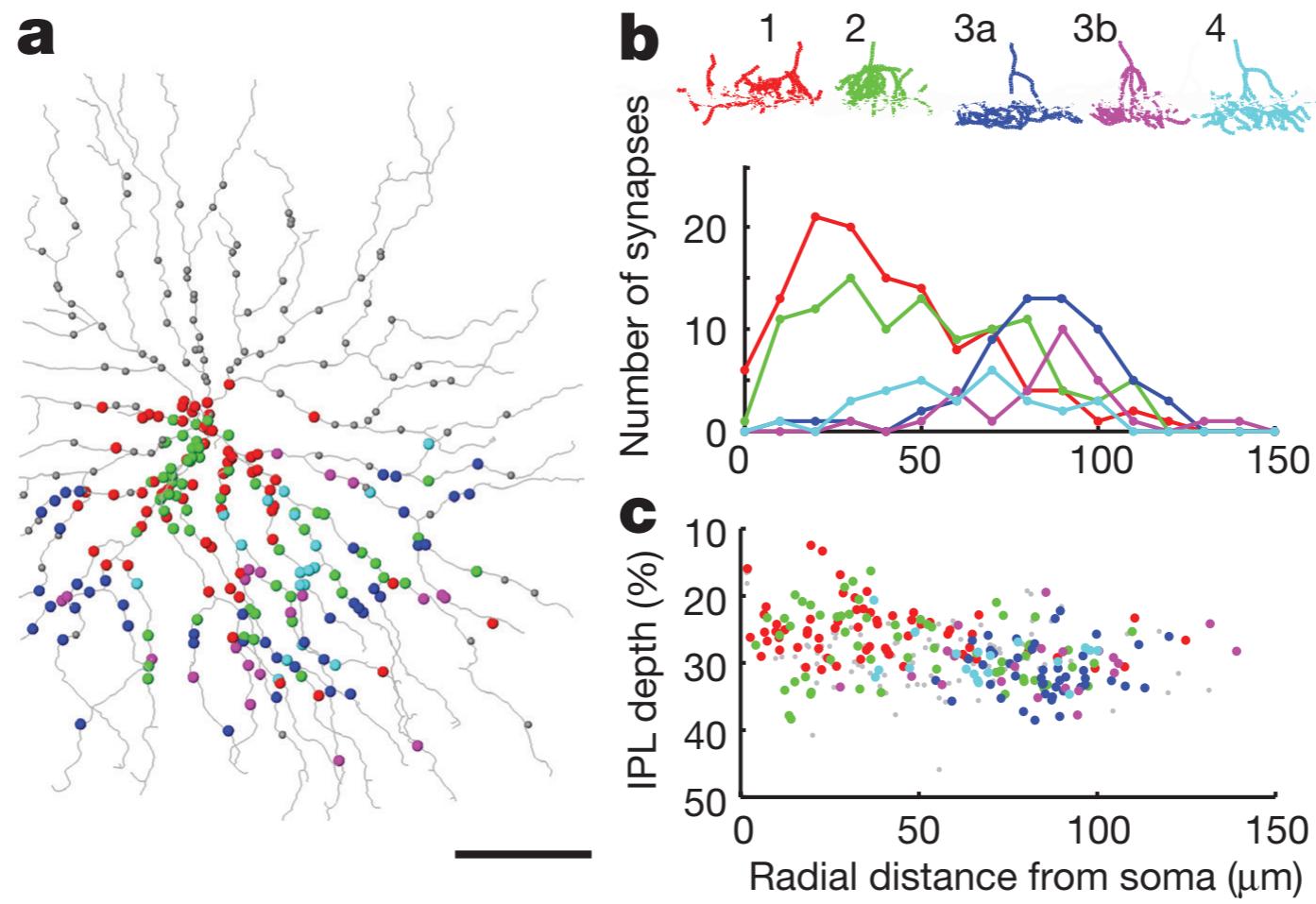


Fly HI neuron that responds to motion stimuli

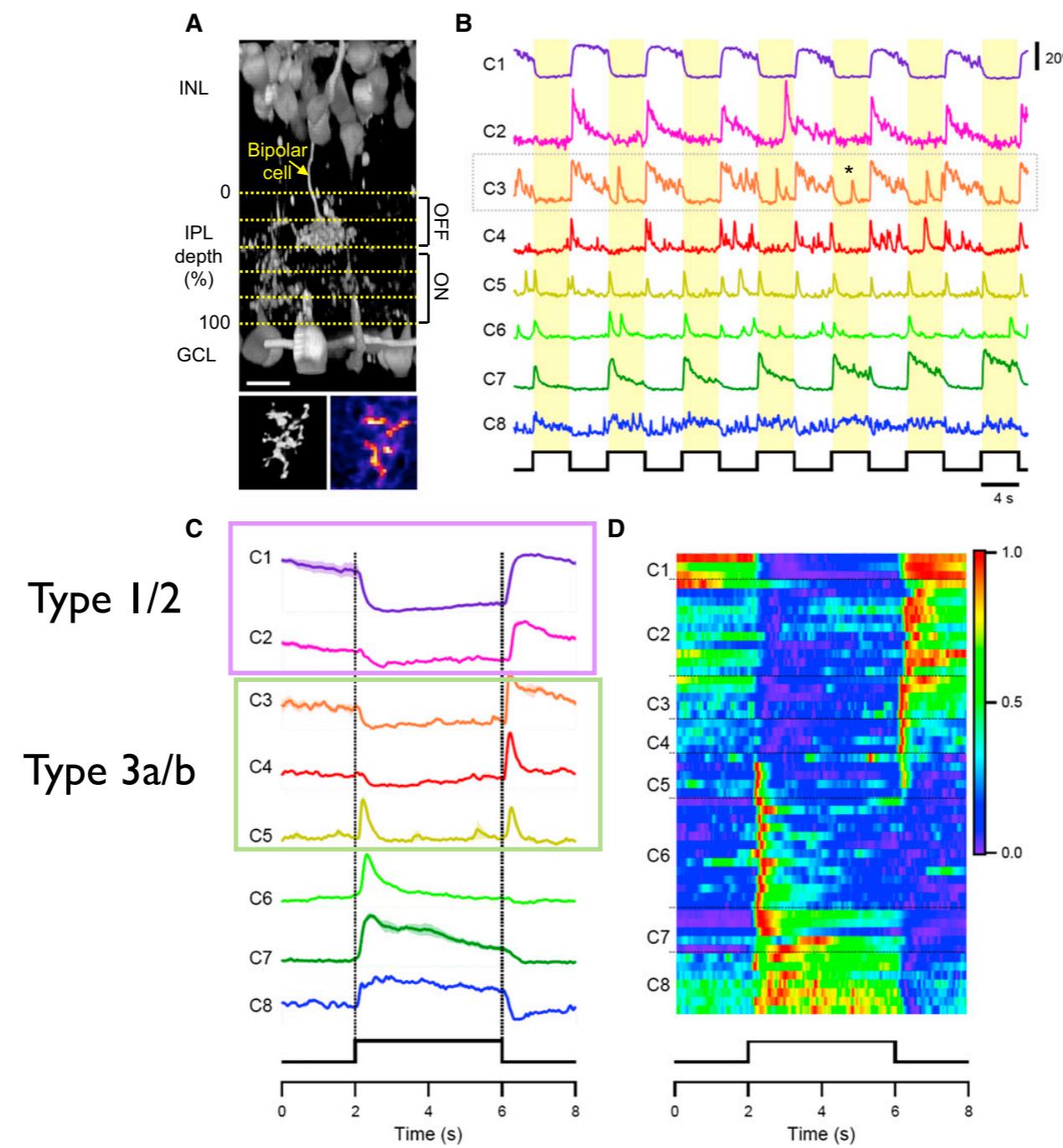
Direction-selective starburst amacrine cell



Connectivity between bipolar and starburst amacrine cells



Physiological Recording of Bipolar cells



Baden et. al.,
Current Biology 2012

Defining the Receptive Field of SAC

$$R(t) = \left[\int D(x, \tau) s(x, t - \tau) dx d\tau \right]^+$$

$$D(x, \tau) = U_s(x)V_s(\tau) + U_t(x)V_t(\tau)$$

Receptive field of starburst amacrine cell

