

Development of retinotopic maps

Nijmegen Summer School 2016

Stephen J Eglan

University of Cambridge

2016-08-09

Background

Slides

Available at: <http://bit.ly/eglen-nijmegen>

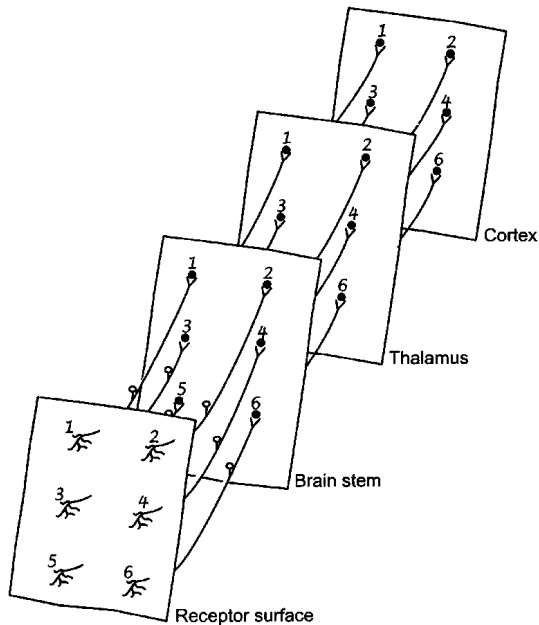
References

Available at: <http://bit.ly/eglen-n-refs>

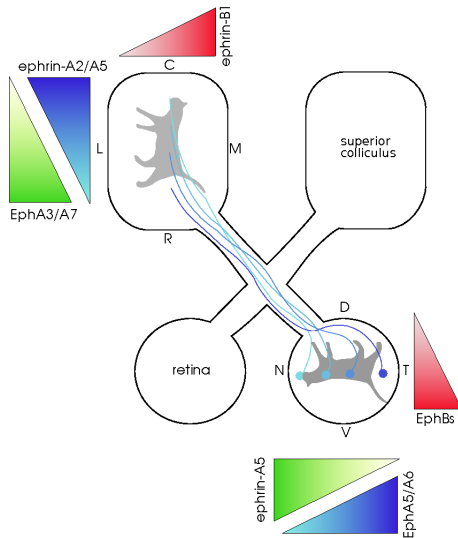
Acknowledgements

Catherine Cutts, Johannes Hjorth, David Sterratt, David Willshaw. Paperpile.

What is a topographic map?



What is a retinotopic map?

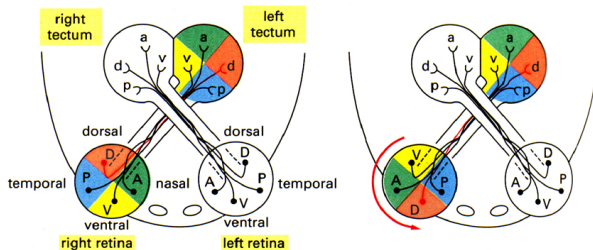


Sperry's experiments

Sperry's experiments:

- 1) Rotation of the eyes of a newt or frog by 180°.
- 2) Cutting of the optic nerves prior to rotation of the eyes by 180°.

In both experiments the animals see their world upside down and back to front. This condition is irreversible.



Result of rotation

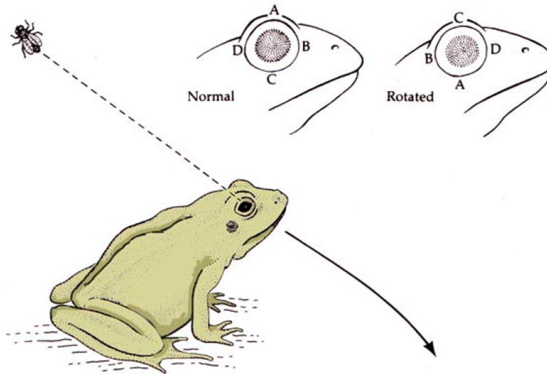
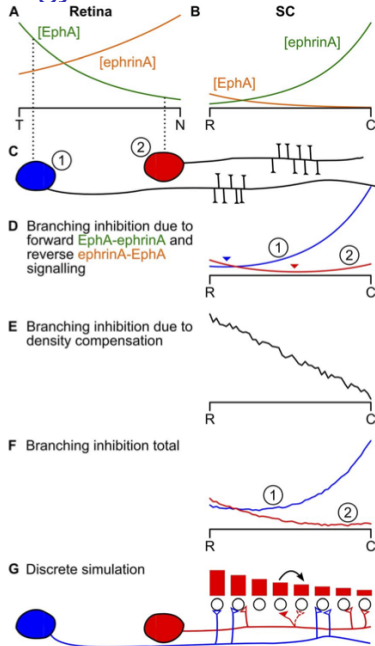


Fig. 21. When the eye is rotated 180° , the frog's prey catching behavior is inverted.
(after Sperry, 1956).

Energy-model for branching (Gierer 1987; Sterratt 2013).

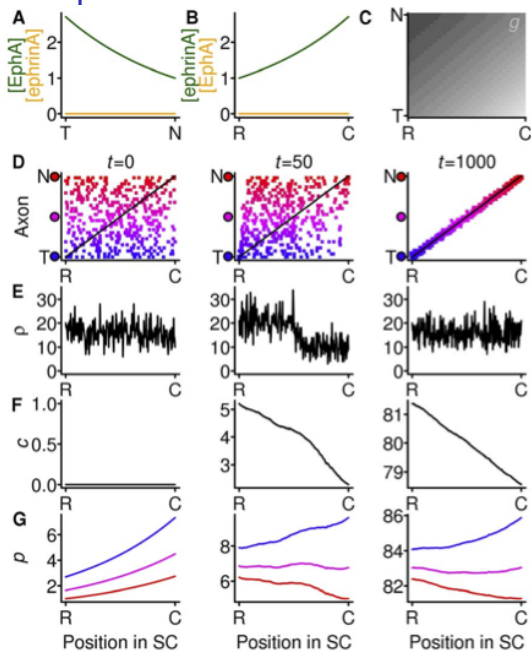


$$g(x, u, t) = [EphA](u)[ephrinA](x) + ephrinA^*(u)[EphA^*](x)$$

$$\frac{dc}{dt} = \epsilon p(x, t) - \eta c(x, t)$$

$$p(x, u, t) = g(x, u, t) + c(x, t)$$

Wild-type development: 1D



Wild-type development: 2D

hello world

(Picture from our 2D simulation).

2 hello world

Activity-based model (Willshaw and von der Malsburg)

Competition brings together lots of models.

refs to add

kaas2002