

9.14

Class #10: Process outgrowth II (Synaptogenesis)

Readings:

- Purves & Lichtman, "Formation of synapses; selection of synaptic connections in skeletal muscle", pp. 205-235.
- Roush, W. , "The supple synapse: An affair that remembers", *Science* [News article on The Neuromuscular Junction],(1996) , 274: 1102-1103.
- Son, Y.-J., Trachtenberg, J.T. and Thompson, W.J. Schwann , "cells induce and guide sprouting and reinnervation of neuromuscular junctions", *Trends Neurosci.*,(1996),19: 280-285.

Also recommended:

- Fields, R.D. and Itoh, K., " Neural cell adhesion molecules in activity-dependent development and synaptic plasticity", *Trends Neurosci*, (1996), 19: 473-480.
- Dai. Z. and Peng. H.B., "From neurite to nerve terminal: induction of presynaptic differentiation by target-derived signals", *Seminars in the Neurosciences*, (1996), 8: 97-106.
- Haydon, P.G. and Drapeau, P., " From contact to connection: early events during synaptogenesis", *Trends Neurosci*, (1995),18:196-201.
- Zigmond, M.J. "Chapter 19: Synapse formation and elimination " by Lichtman, Burden, Culican, and Wong, *Fundamental Neuroscience*, (1999), pp. 547-580.

Questions (see Purves & Lichtman unless otherwise noted):

[Purves]

1. How can synapses be detected? (fig. 1 and Box A)
2. What is "multiple innervation" in motor neuron axon projections, and what happens to it? (Fig. 5)
3. Describe the use of alpha-bungarotoxin in the study of developing muscle fibers, and what has been found. (Figs. 7, 8 and text)
4. Describe an effect of the paralytic agent curare on muscle endplate formation. (p. 211 fig.4; p. 222)
5. Describe an effect of electrical stimulation of developing muscle fibers which have been paralyzed with curare.
6. What are "basal lamina ghosts" and why have they been studied in experiments on regeneration of motor axons? How is regeneration different from initial development? (p. 223)
7. The innervation of muscle fibers appears to be very selective, in that stereotyped patterns of innervation occur in all members of a species. Is it true that synapse formation is highly selective? Describe an experiment to back up your statement. (Ch. 10)

[Roush]

8. Why are neurobiologists so interested in the fruit fly neuromuscular junction?
9. In the fly, how is bouton number related to fasciculin II? What does cyclic AMP do to the *Aplysia* homologue of FasII, called apCAM (Aplysia cell adhesion molecule)?
10. What is the role of CREB (the cAMP response element-binding protein, a transcription factor) in plasticity of fruit fly neuromuscular junction?

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11. How might Schwann cells underlie collateral sprouting in partially denervated muscle?