

9.14**Class #16: Regional specificity, 1****Readings:**

- DeRobertis, E. M., Oliver, G. and Wright, C.V.E. , " Homeobox genes and the vertebrate body plan", *Sci. Amer*, July 1990, pp: 46-52.
- Guthrie, S., " Trends in Neuroscience ",*The status of the neural segment* ,1995, 18: 74 - 79.
- Dubbeldam, J.L., Fritsch, B., Glover, J.C., Guthrie, S. " Letters to the Editor", *Trends in Neuroscience* , 1995, 18: 485 - 488. [Sarah defends herself very well!]
- Butler, A. B. and Hodos, W., *Comparative Vertebrate Neuroanatomy*, 1996, pp. 120 - 144. [This is a difficult reading. For this session, read the first few pages, 120-125, and study the first 7 figures; then study Table 10-1 and fig. 10-1.]

Also recommended:

- Wolpert, L., "Chapter 4 ,Patterning the vertebrate body plan II: the mesoderm and early nervous system", *Principles of Development*, 2nd edition , Oxford Univ. Press, pp. 109-139.
- Wolpert, Chapter 7, pp. 105 - 117; 1st edition, pp. 129 - 130.
- Lumsden, A. and Krumlauf, R., " Patterning the vertebrate neuraxis ", *Science*, 1996, 274: 1109 - 1115.
- Guthrie, S. , " Patterning the hindbrain" *Current Opinion in Neurobiology* ,1996, 6: 41 - 48.

Questions:

[De Robertis et al.; Wolpert]

1. Define "morphogenetic field" (see also: Purves & Lichtman, previous reading) and give an example of an experiment with results which demonstrate this concept.
2. What is a homeotic transformation (from a homeotic mutation)? Give examples.
3. What are the "homeobox" and the "homeodomain"?
4. What is the relevance of homeodomains to transcription factors?
5. Compare the homeobox genes of vertebrates and invertebrates (just major points).
6. Describe major effects of retinoic acid and bFGF on homeobox genes.
7. Describe the pattern of tissue expression of a homeobox gene.
8. On how they work: What are the effects of blocking the XIHbox1 protein in the early *Xenopus* embryo? (DeRobertis et al.) Also, describe effects of deletion or overexpression of Hox genes (Wolpert, in class).

[Guthrie]

9. What do you think are the most important criteria for defining a neuromere? Give two criteria that are being emphasized in recent studies.
10. Describe several morphological characteristics of rhombomeres (hindbrain segments in the early embryo).
11. Guthrie says that neuromeres in the diencephalon may represent regional specialization rather than true segmentation. What does she mean?
12. She deals with possible segmentation of the spinal cord in a related way. How may the segmentation there be different from that of the hindbrain?

[Letters]

13. What, basically, is the nature of immunohistochemical evidence for rhombomeric control of development?
14. What does Guthrie consider to be the central misconception of her critics ?

[Butler and Hodos]

15. Why do Butler and Hodos find the traditional enumeration of 12 cranial nerves to be inadequate? (p. 120, 133-134, 127)
16. Why do the authors suggest that embryonic hindbrain divisions result from a kind of "bar code" pattern of gene activity? (p. 122 col. 1, fig. 9-1)
17. What are "somitomeres" as compared with "somites"? (p. 123)
18. Contrast neural crest and placodal origin of sensory and other structures (main features). Give examples.