

**THE UNIVERSITY OF CONNECTICUT  
NEUROSCIENCE PROGRAM  
MEDS370. INTRODUCTORY NEUROSCIENCE  
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October 19, 2001**

Reading: Kandel et al, 4<sup>th</sup> ed: Table 52-1; Figs 52-2, 8--9, 11;  
Table 53-1;  
pp1063-1073; Figs 54-7, 54-16.

CRITICAL PERIODS & STAGES

Induction of Neural Tube  
(Neurulation)

Cell Fate (Cell Lineage)

CRITICAL FACTORS

Chemical Inducers & Organizers  
e.g., Bone morphogenetic protein 4 (BMP4)  
from neural plate  
Sonic hedgehog(from notochord)

BMP4, SHH, HOX genes (regional morphogens), transcription factors in neural tube

Depends on time, place and ...

...CRITICAL EVENTS

1. Proliferation (cell division in matrix zone is terminal for most but not all neurons)

Mitogens, cyclins, growth factors e.g.,  
Fibroblast growth factor (FGF)  
To & fro' migration in matrix zone

2. Migration=translocation from the matrix to the mantle zones

Tropic factors:  
Contact guidance or contact inhibition by  
Cells or extracellular matrix molecules  
(e.g., laminin)  
Chemical gradients (e.g., growth factors, neurotransmitters, reelin)

3. Specification of Connections  
Differentiation of axons, dendrites, and synapses

Tropic Factors (directional) (e.g., netrin)  
Trophic Factors (structural) (e.g., agrin)  
Neural cell adhesion molecules (e.g. NCAM)  
Specific Growth Factors, e.g., Neurotrophic factors, such as nerve growth factor (NGF), brain-derived neurotrophic factor (BDNF).

4. Cell Death vs. Survival and Growth  
Facultative  
Obligatory (apoptosis)

Depend on growth factors & activity  
---> Make functional connections to survive  
---> Programmed cell death by gene control