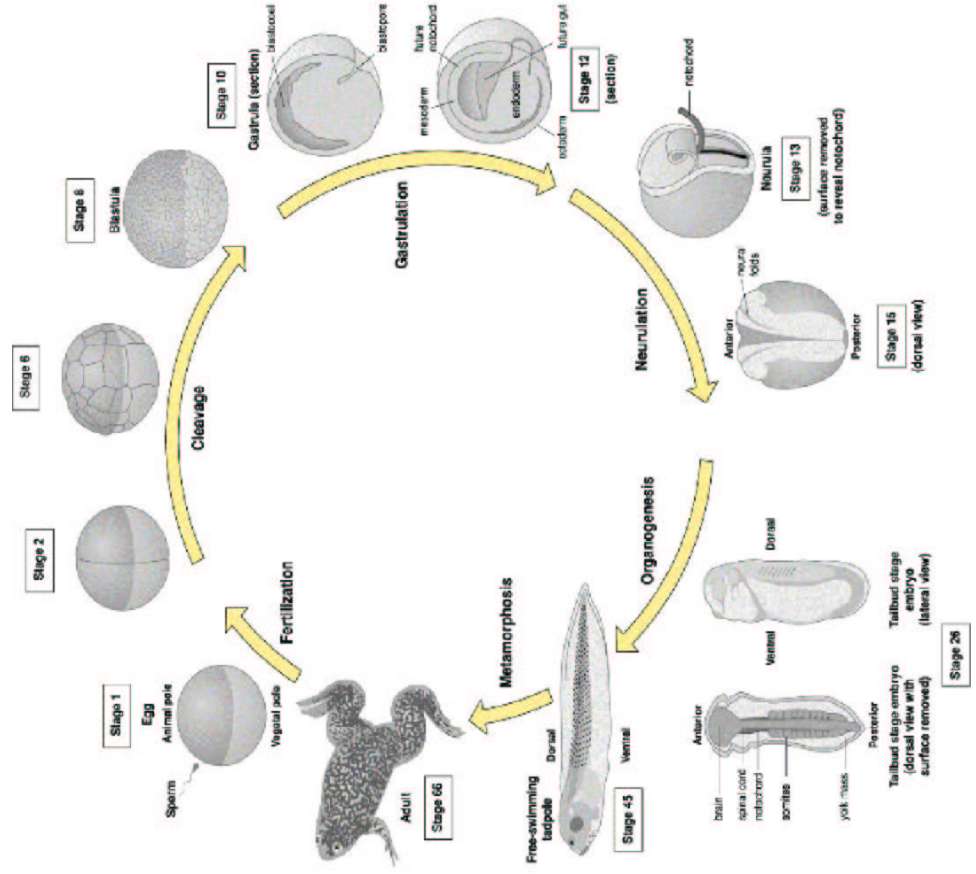
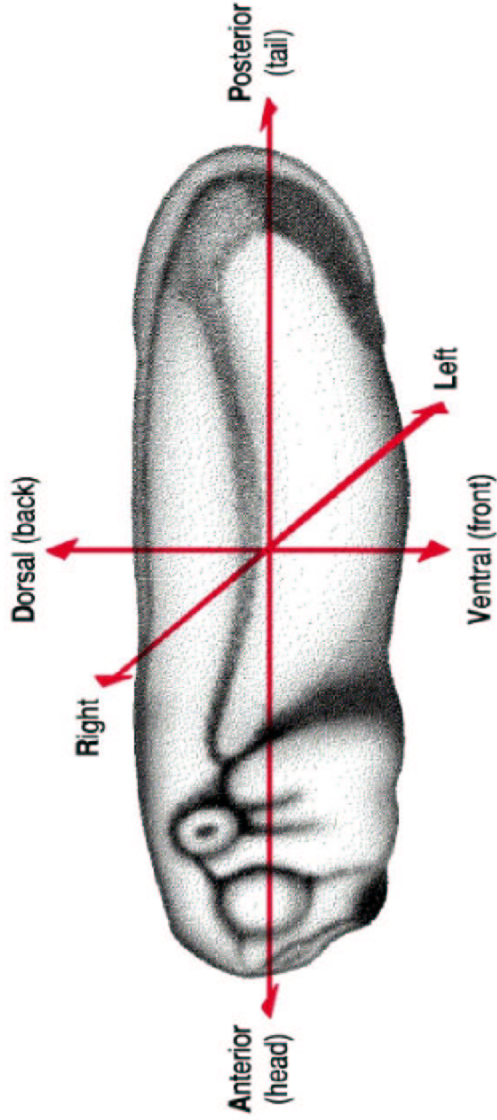
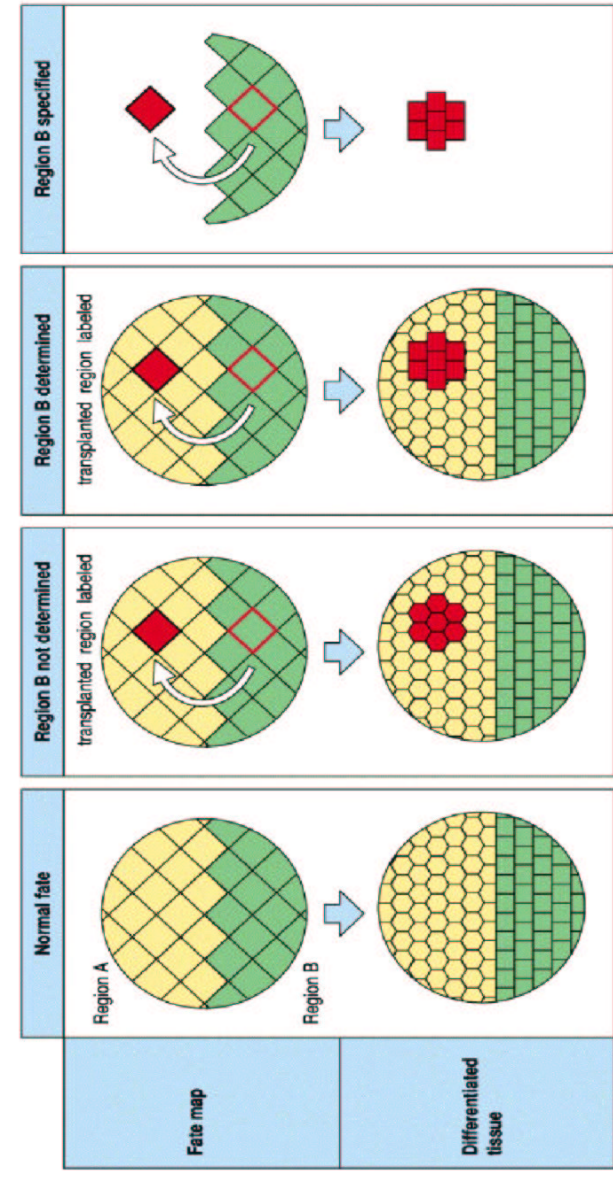
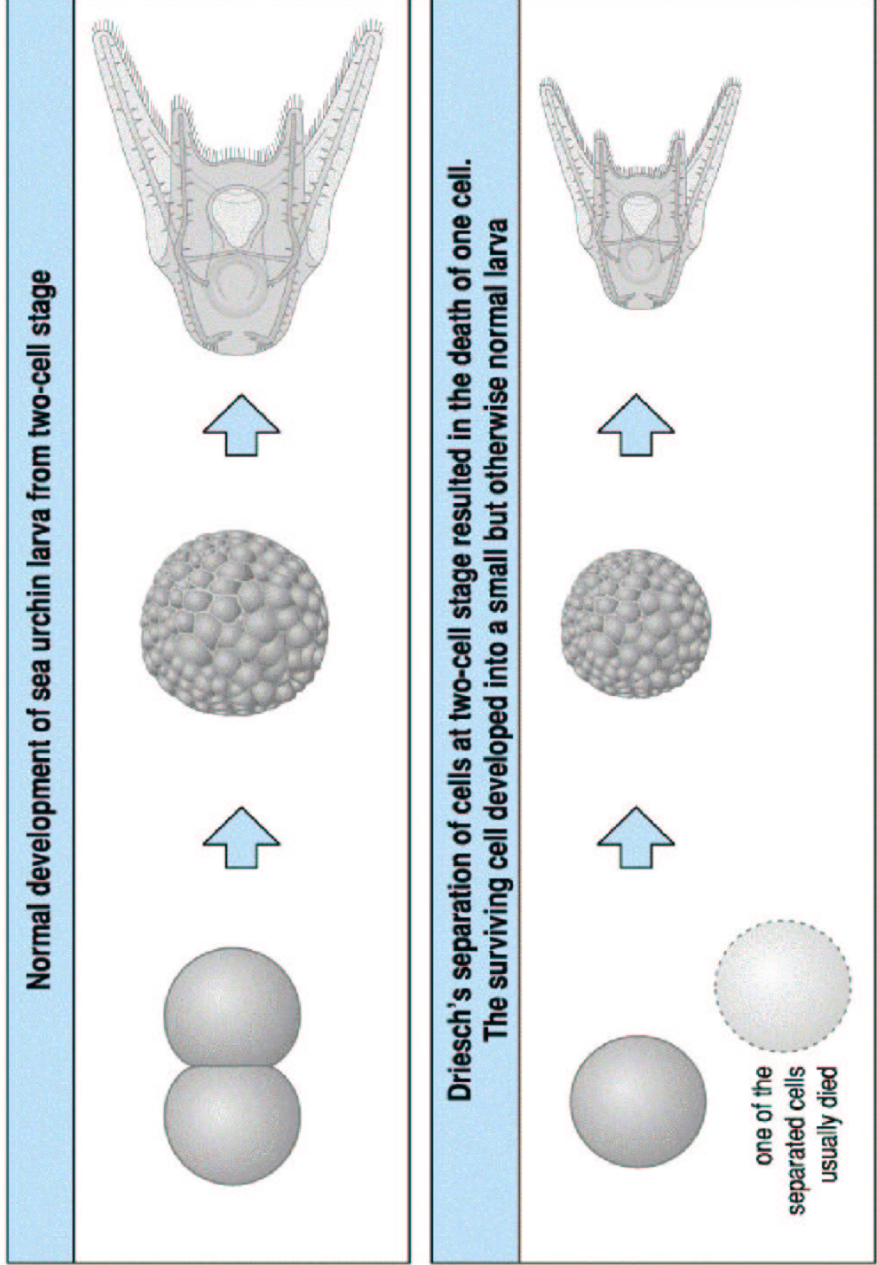


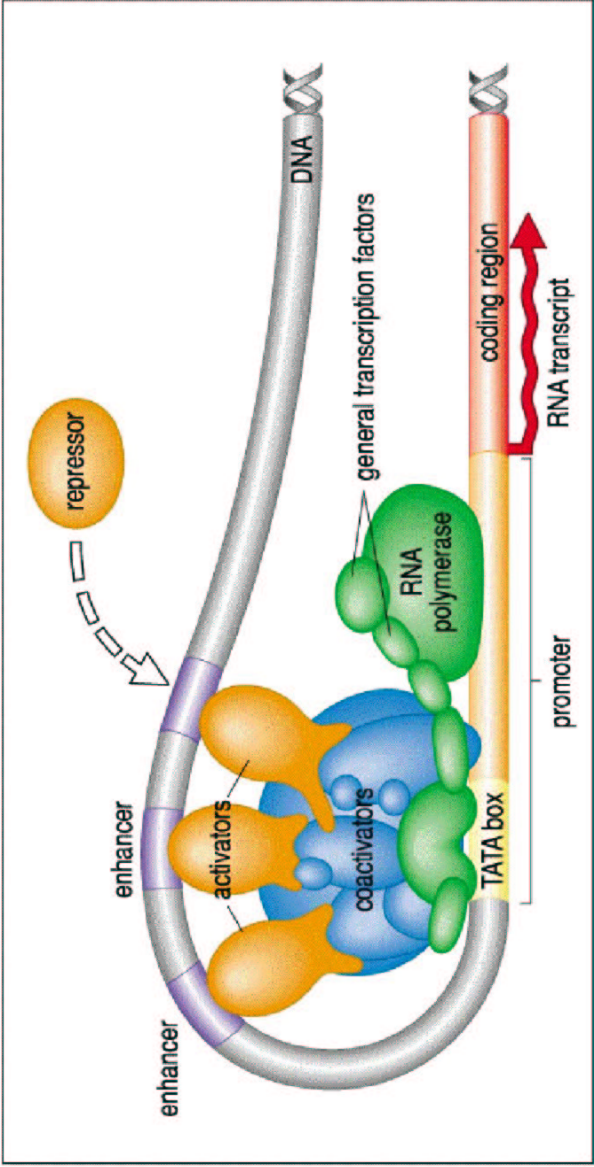
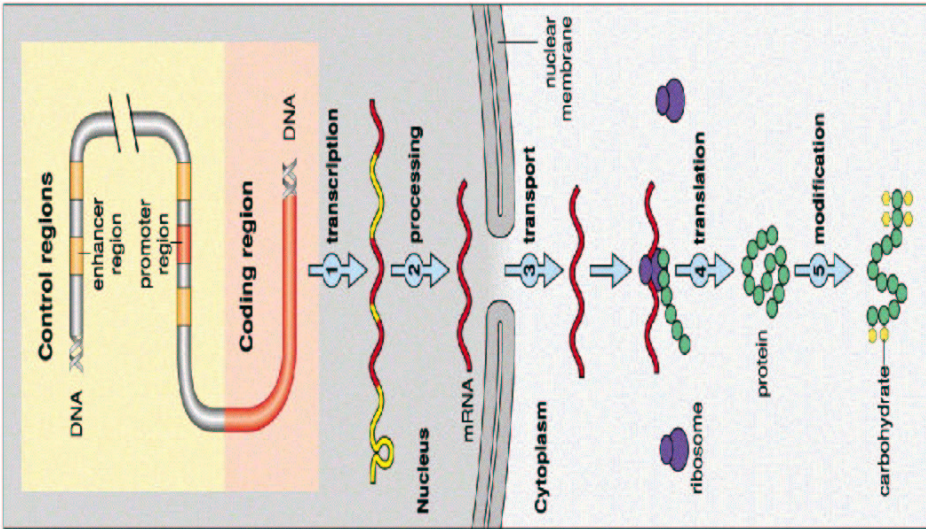
# Embryos are often Cartesian

*Xenopus laevis* tailbud stage embryo



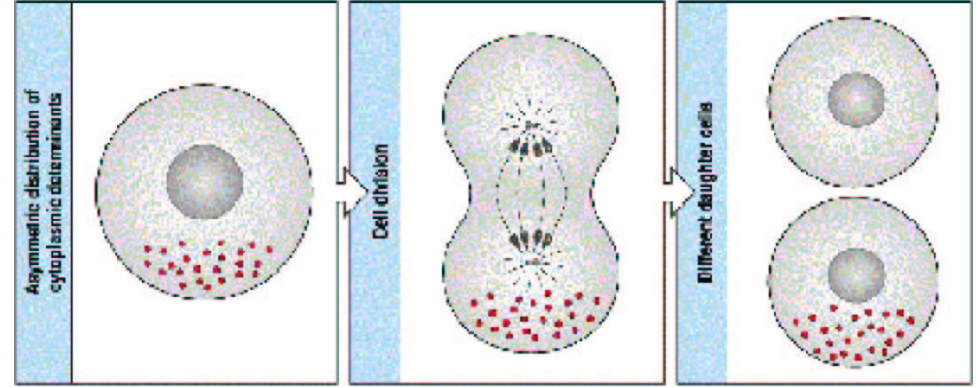
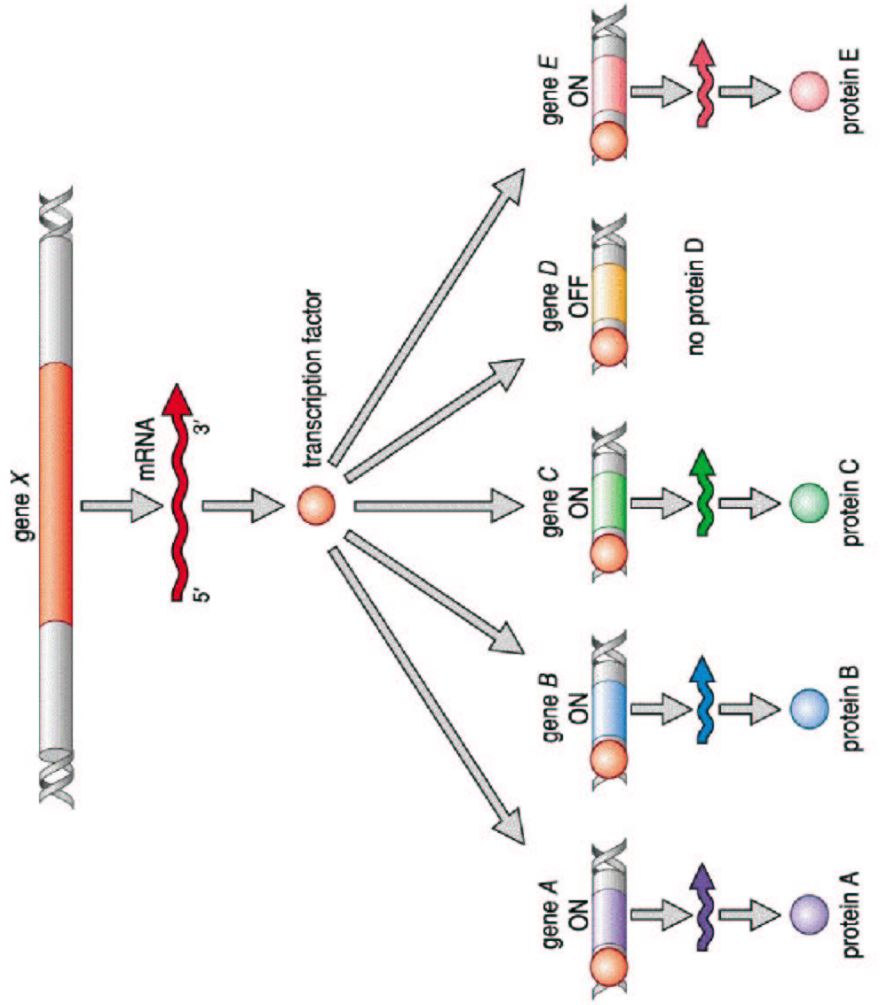






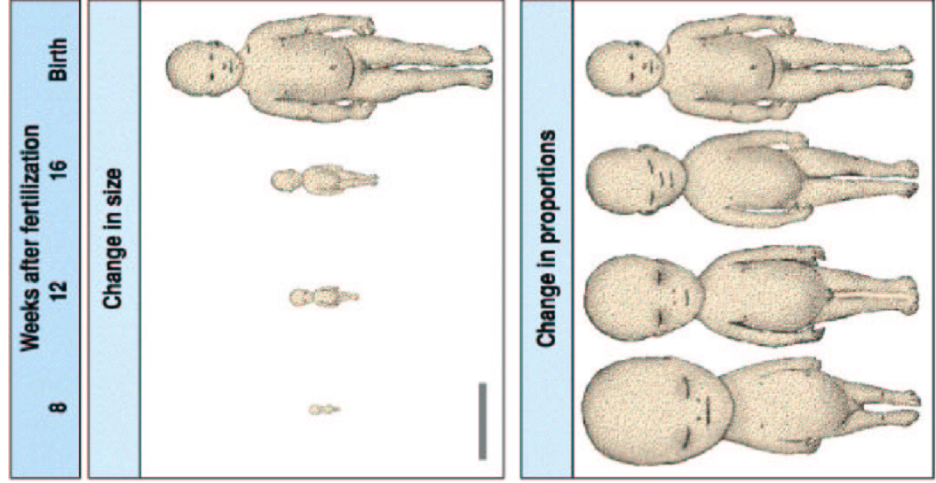
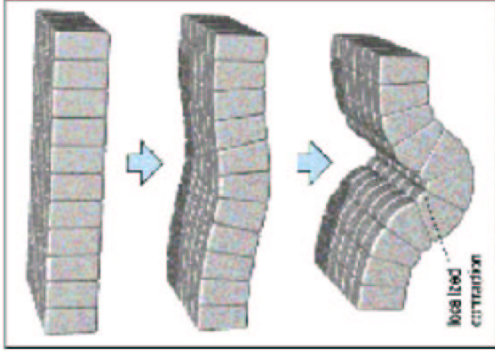
Genes are a bit boring , proteins are the wizards. But the cis - regulatory regions of genes determine where and when proteins are made. That is the core of development as proteins determine the behaviour of the cells.

DNA is NOT a blueprint - the embryo contains a generative programme

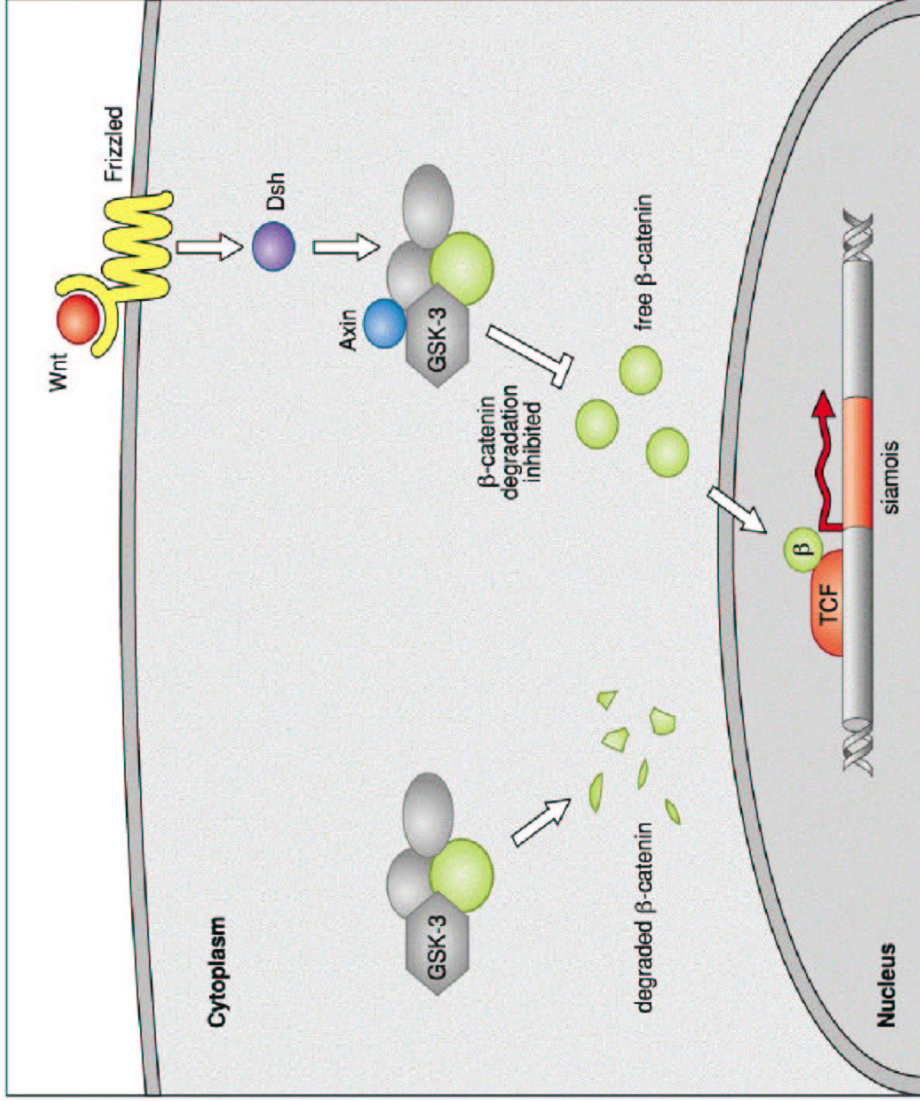


Asymmetric division

Localised contraction can cause curvature and infolding







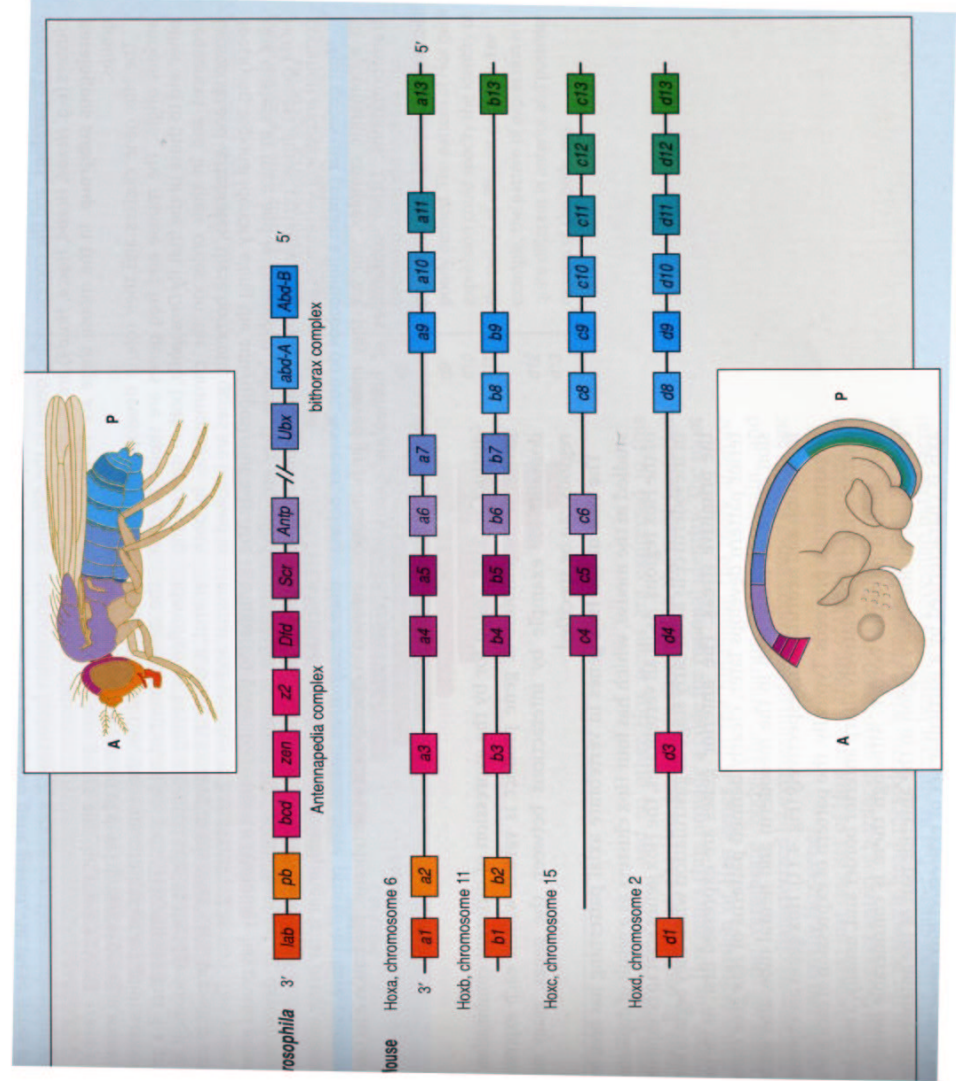
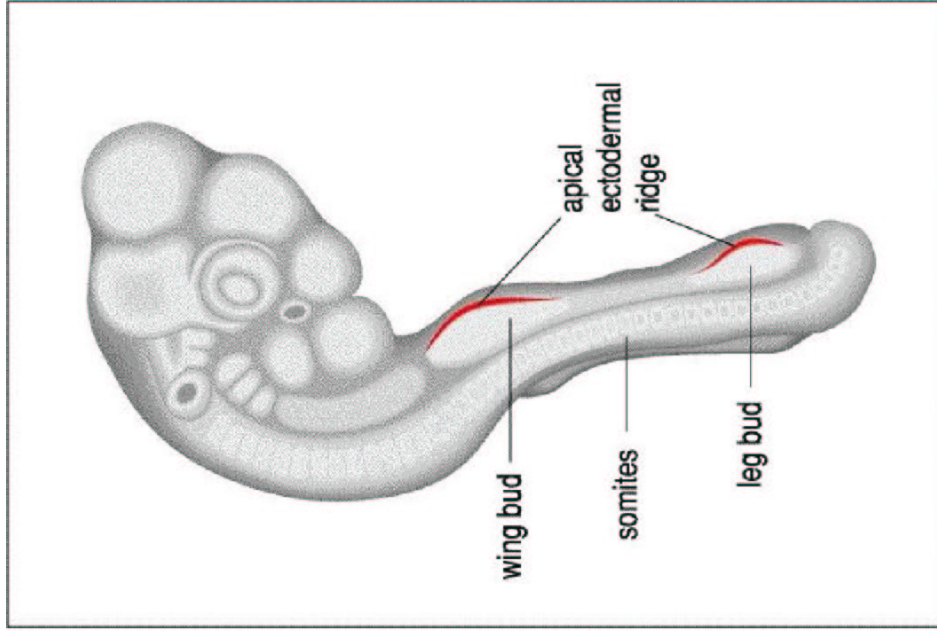
Let the remover it is an ever shaken alteration with to love  
 tempests which fixed height remove is admit mark worths  
 the edge finds no me star rosie it even and cheeks or times  
 of bending sickles and it his on marriage the alters is though  
 with O every his wandering upon not looks be bends is love  
 when mindes hours come whose never although love barke  
 taken writ and lips ever but me that within of to proved  
 impediments loved, be is compass to out I and lov's weekes,  
 this if alters true not doome not man nor the his unknowne  
 never no breefe not error it beares foole to

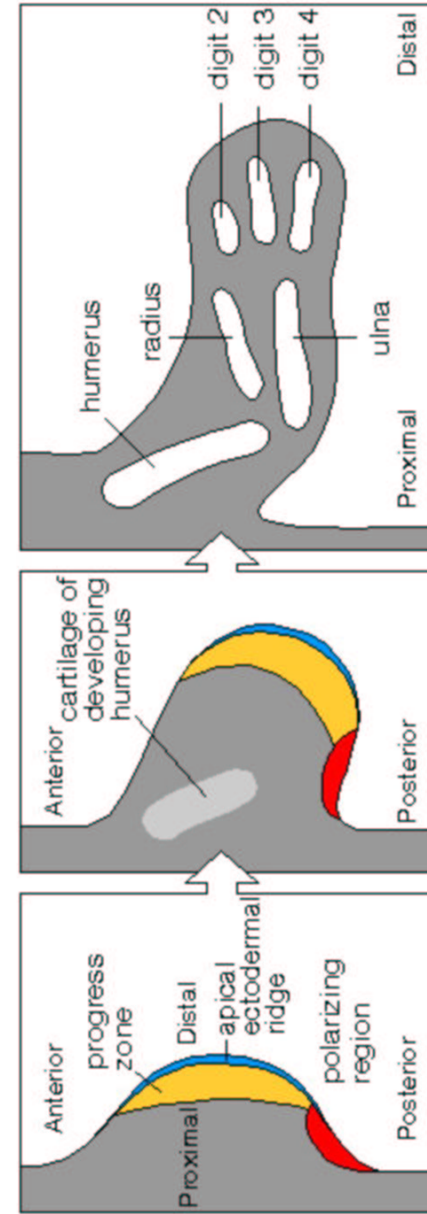
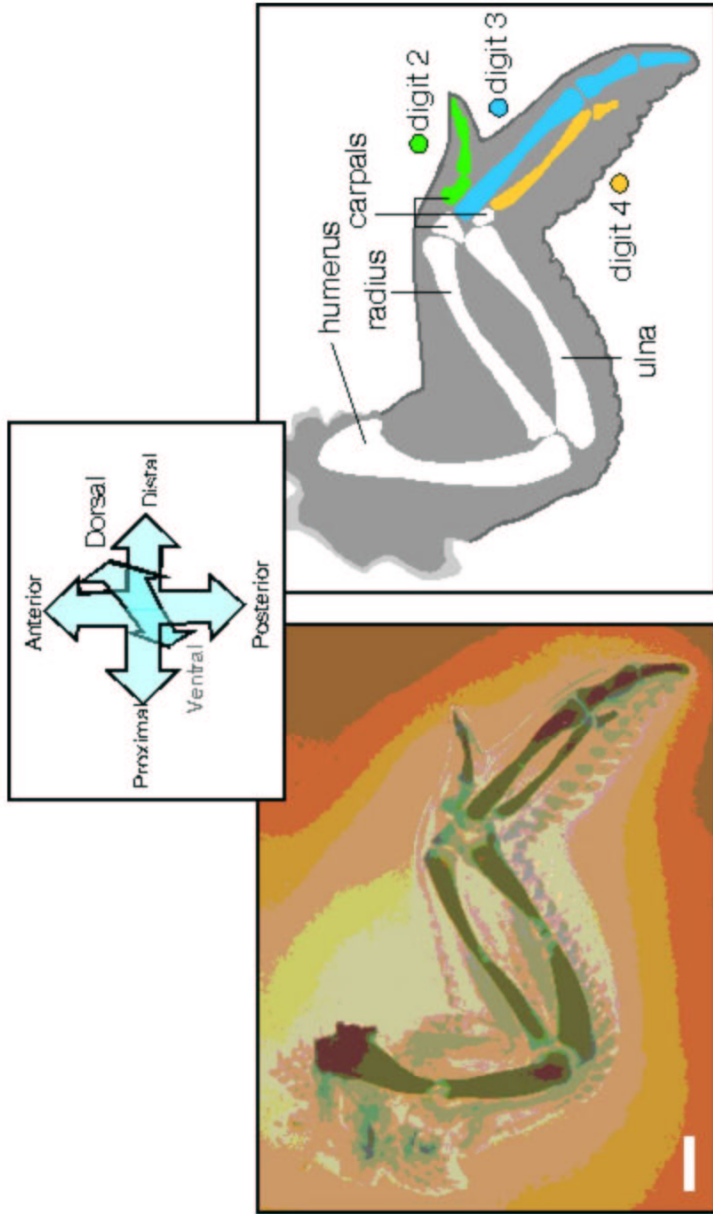
Let me not to the marriage of true mindes  
Admit impediments, love is not love  
Which alters when it alteration findes,  
Or bends with the remover to remove.  
O no, it is an ever fixed marke  
That lookes on tempests and is never shaken;  
It is the star to every wandring barke,  
Whose worths unknowne, although his heighth be taken.  
Lov's not Times foole, though rosie lips and cheeks  
Within his bending sickles compasse come,  
Love alters not with his breefe houres and weekes,  
But beares it out even to the edge of doome:  
    If this be error and upon me proved,  
    I never writ, nor no man ever loved.

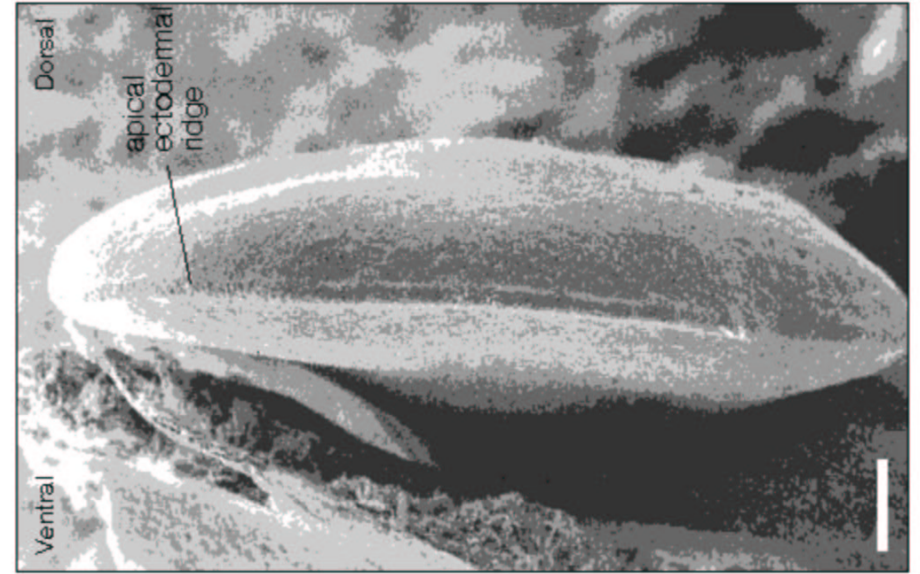
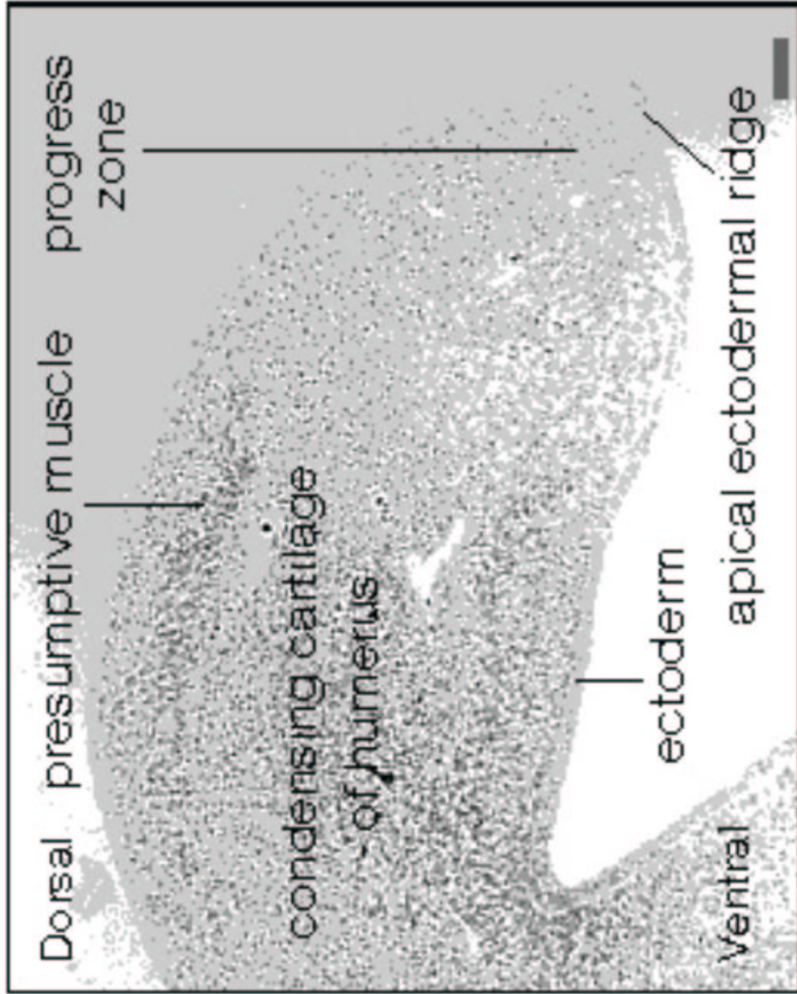
The cell is more complicated than the embryo!!!

The same signals are used again and again, the  
response depends on the cell's history

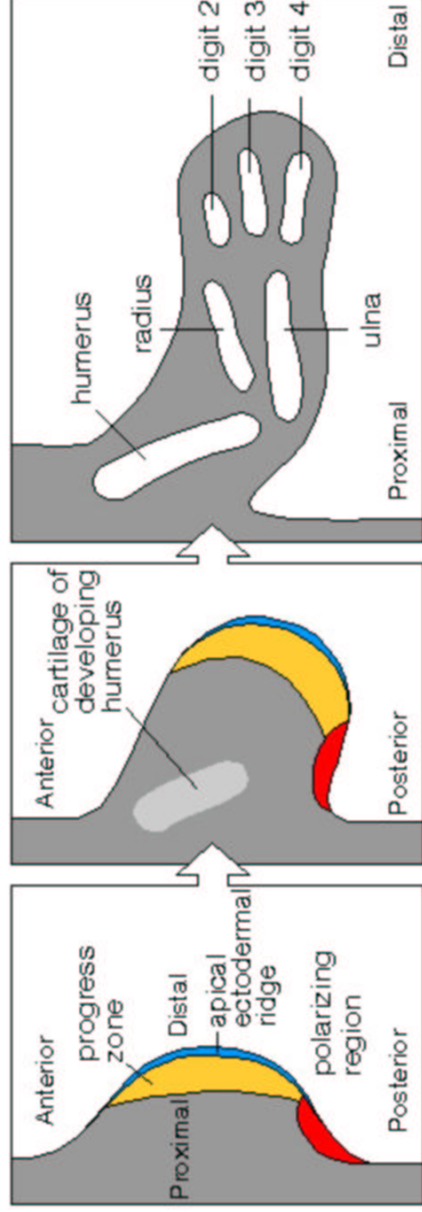




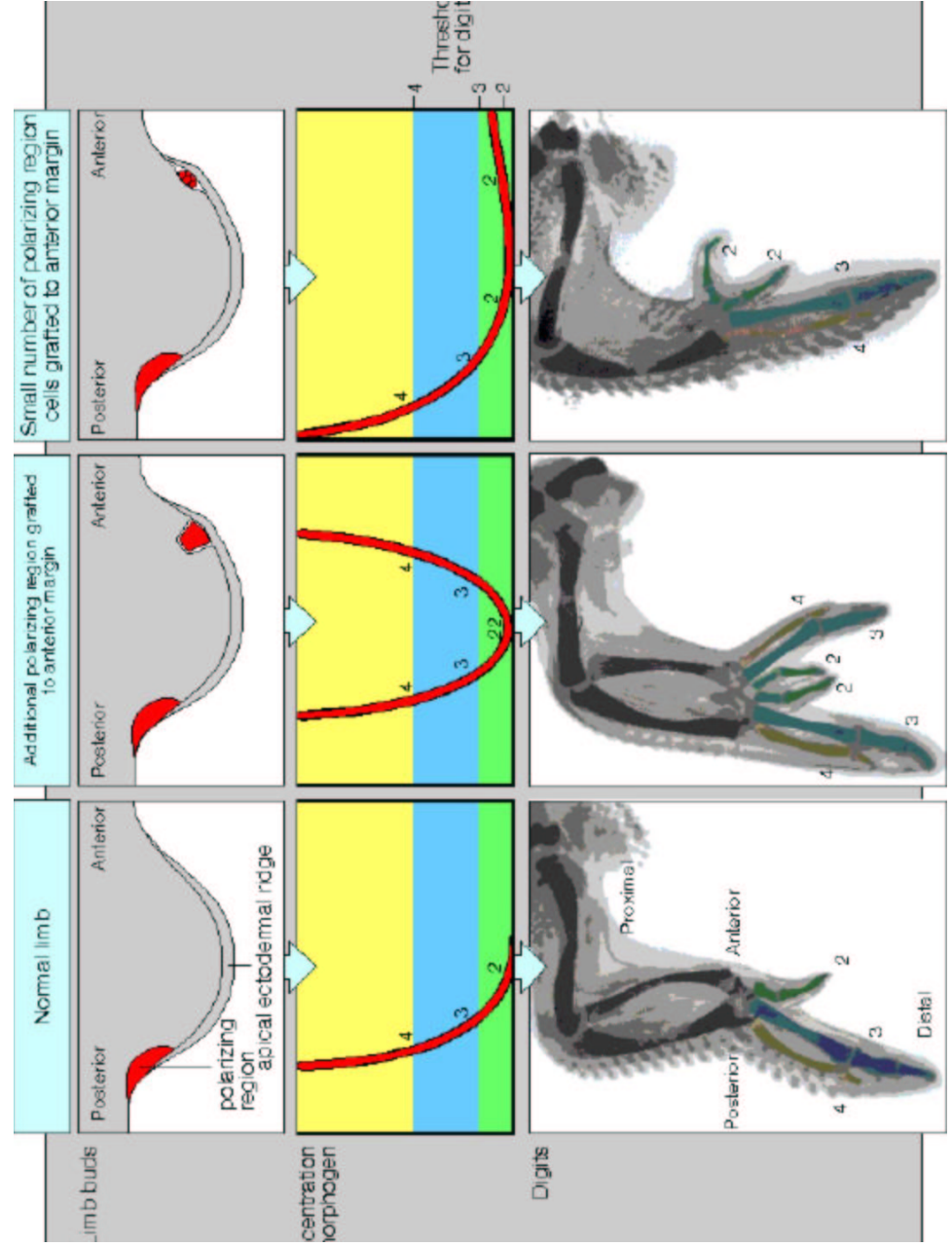
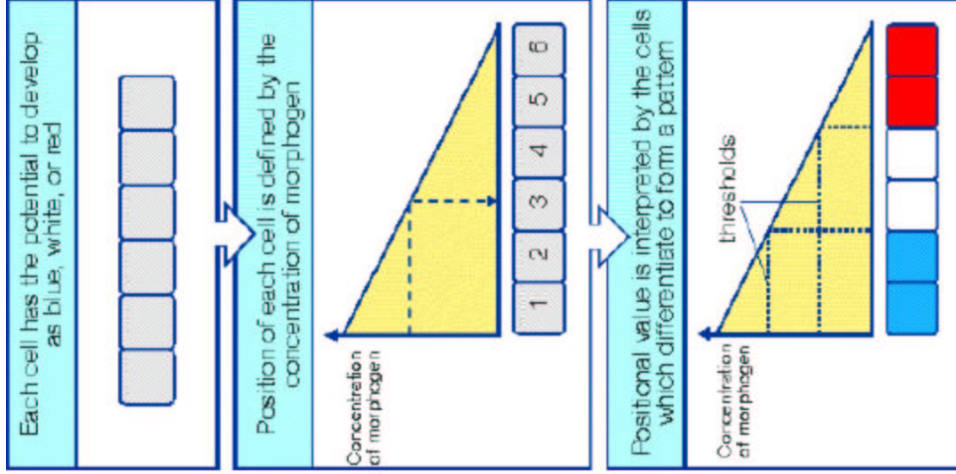




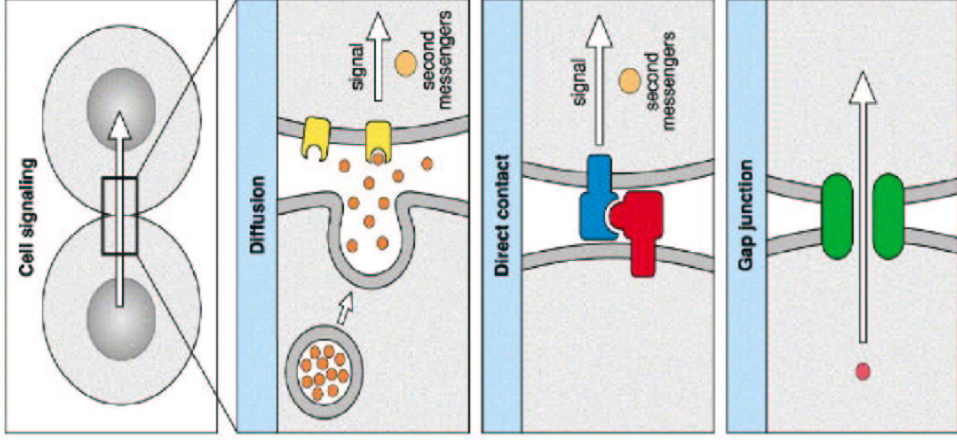




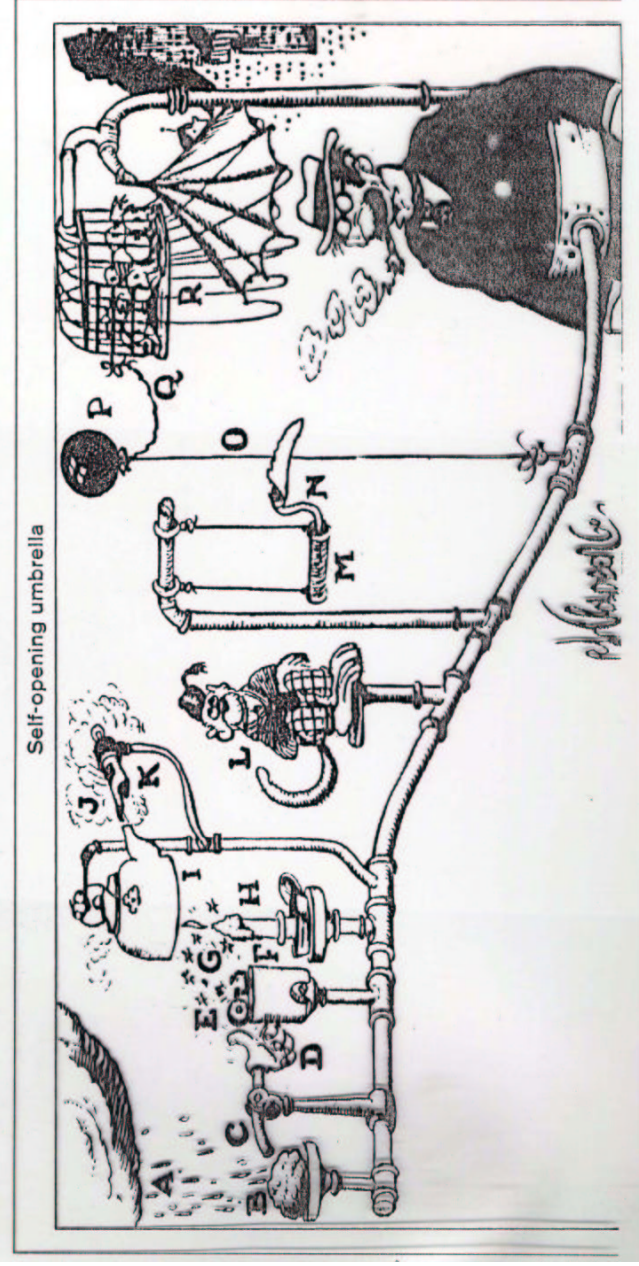
| Family  | Receptors   |
|---|---|
| <p><b>Fibroblast growth factor (FGF)</b><br/>Ten mammalian FGFs; FGF-1 to FGF-10 and eFGF</p>   | <p>Receptor tyrosine kinases</p>  |
| <p><b>Epidermal growth factors (EGF)</b></p>  | <p>EGF receptor</p>   |
| <p><b>Transforming growth factor-<math>\beta</math> (TGF-<math>\beta</math>)</b><br/>Large family, which includes activin, Vg-1, bone morphogenetic proteins (BMPs), nodal (mouse), decapentaplegic (<i>Drosophila</i>)</p> | <p>Receptors associated with a cytoplasmic serine-threonine protein kinase. Receptors act as dimers</p> |
| <p><b>Hedgehog</b><br/>Hedgehog in insects,<br/>Sonic hedgehog and Indian hedgehog in vertebrates</p>   | <p>Patched</p>  |
| <p><b>Wingless (Wnt)</b><br/>Wingless in insect,<br/>various Wnt proteins in vertebrates</p>  | <p>Frizzled</p>   |
| <p><b>Delta and Serrate</b></p>   | <p>Notch</p>  |
| <p><b>Ephrins</b></p>   | <p>Ephrin receptors</p>   |





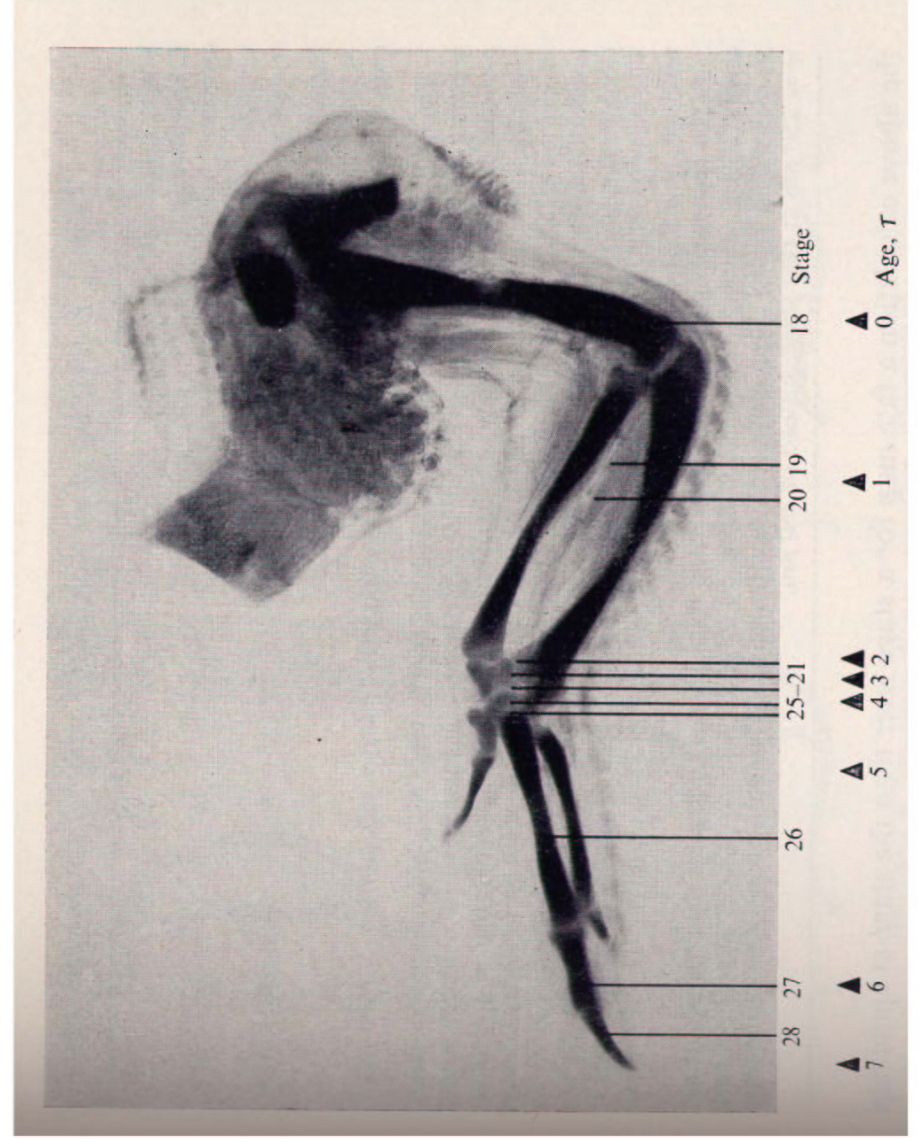
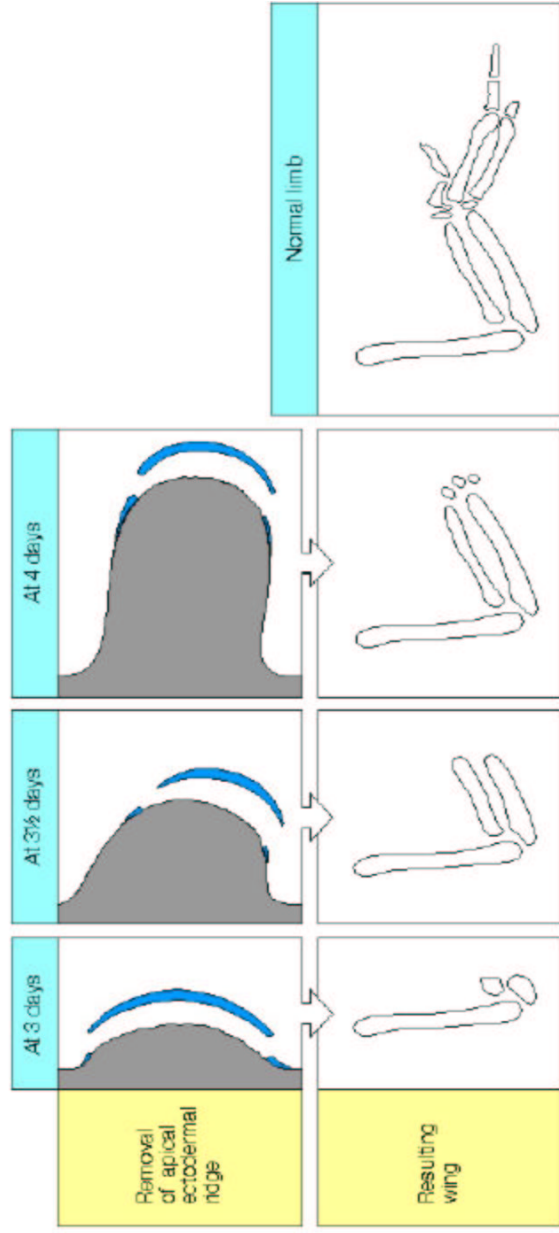


Signal form rain results in umbrella opening

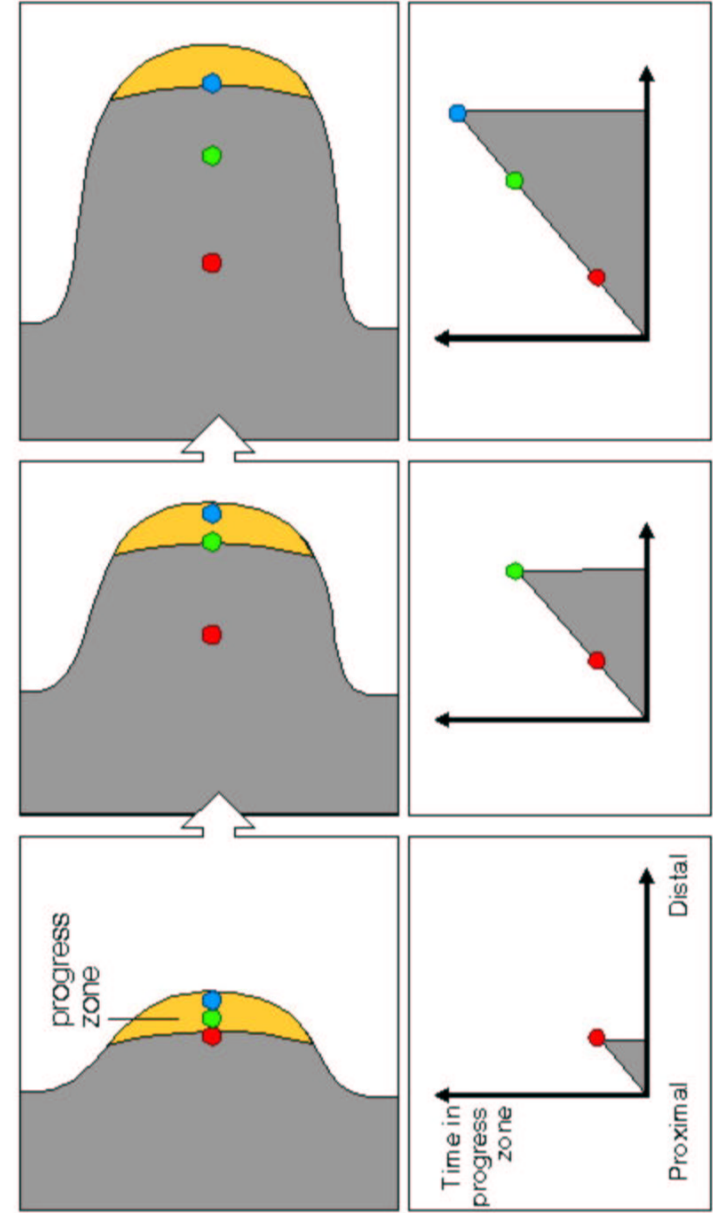
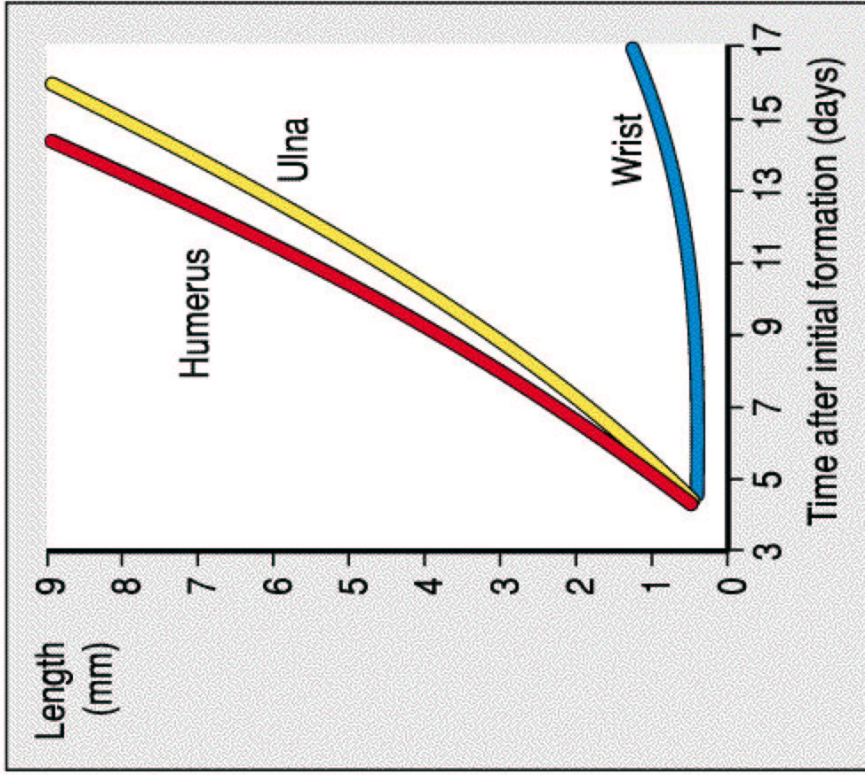


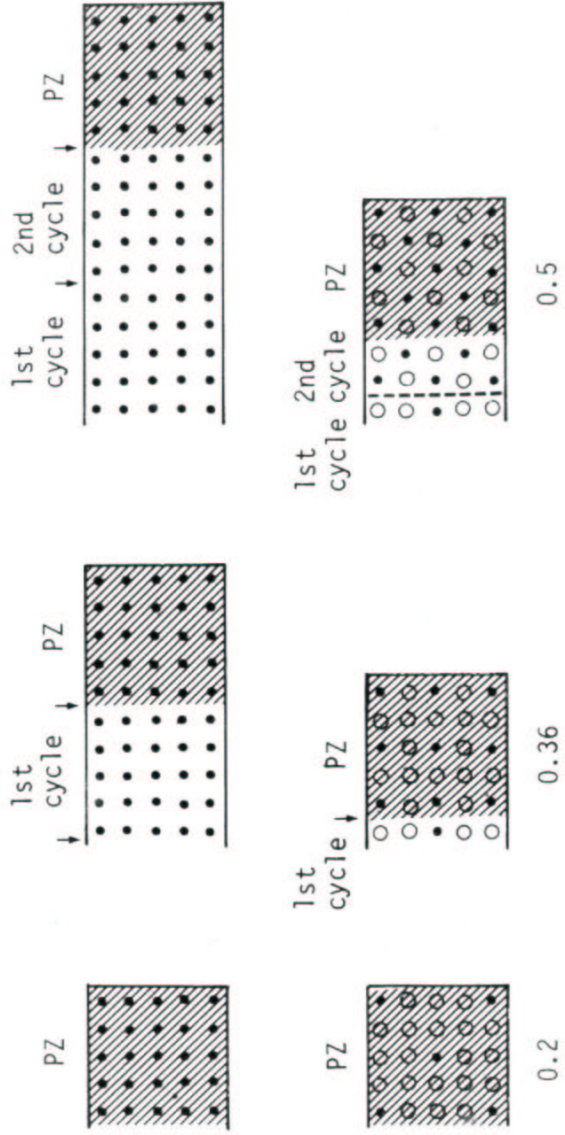
Model of signal transduction: monkey puzzle



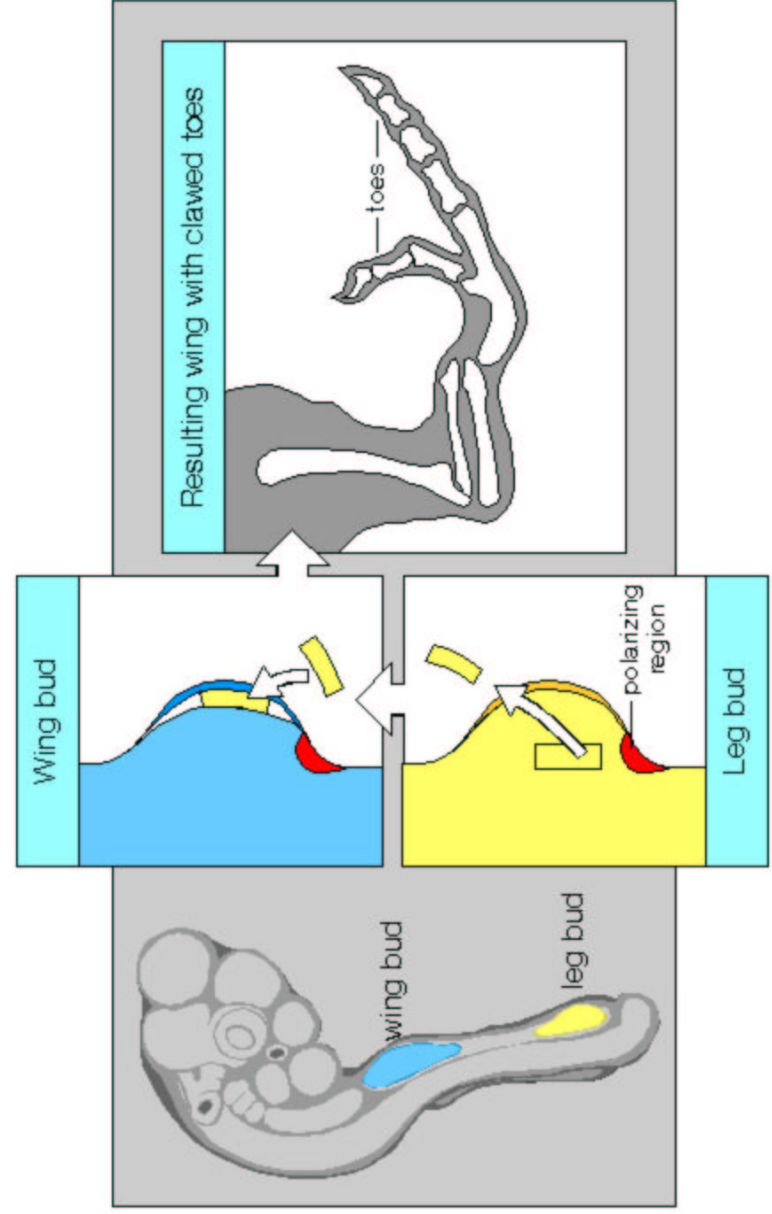


Growth limb elements

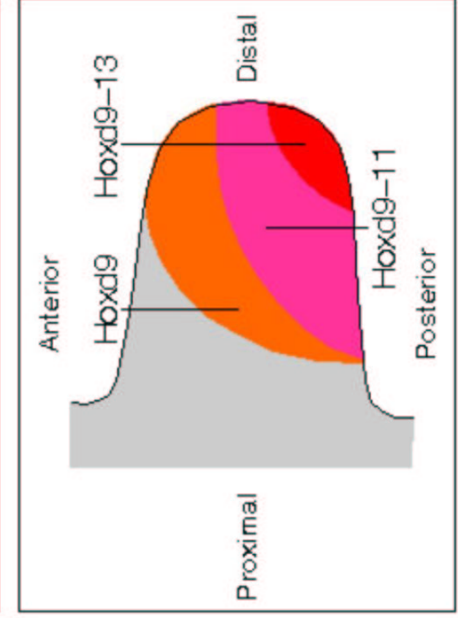
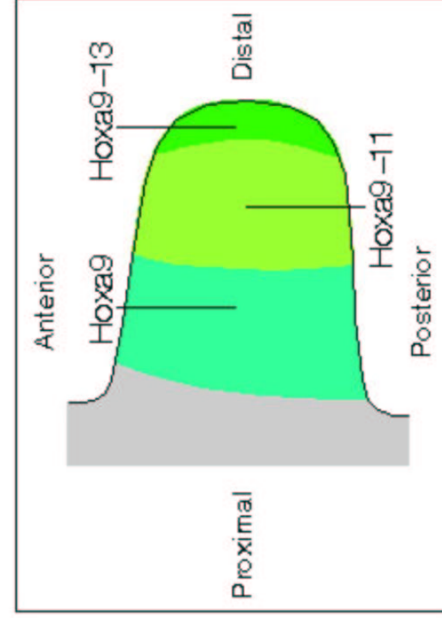
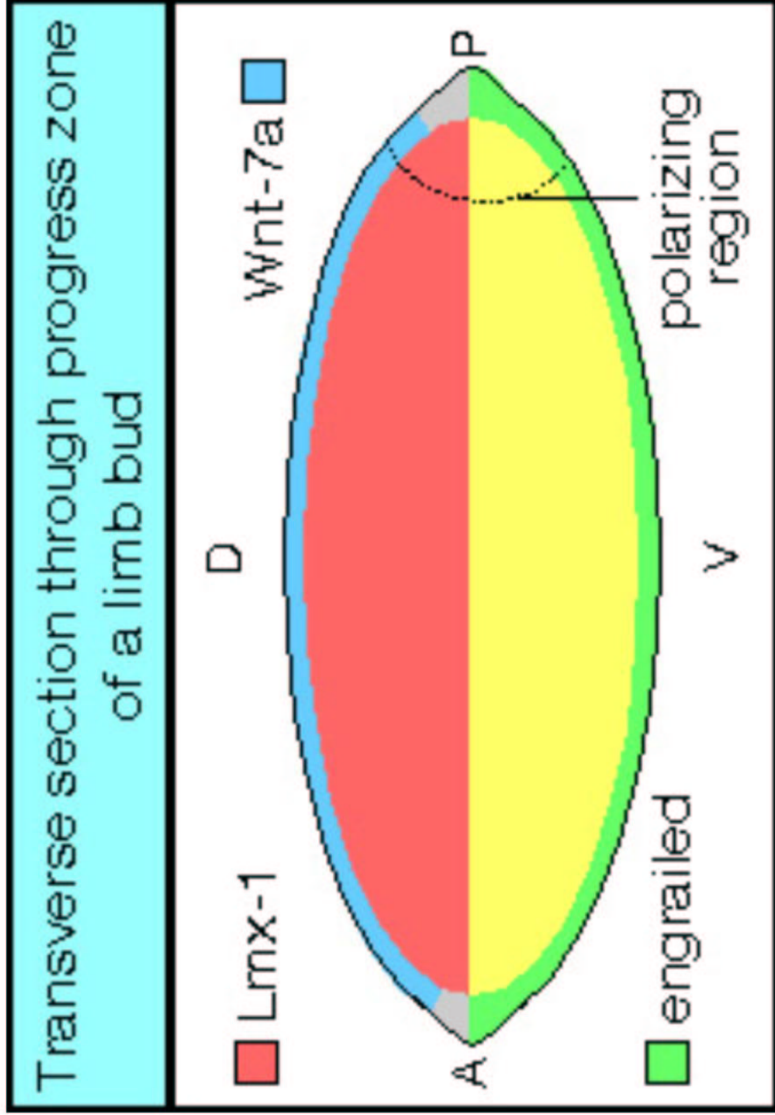


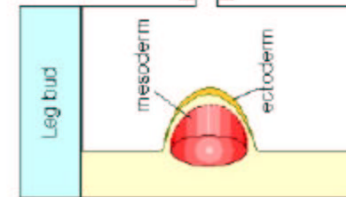
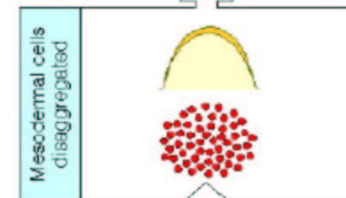
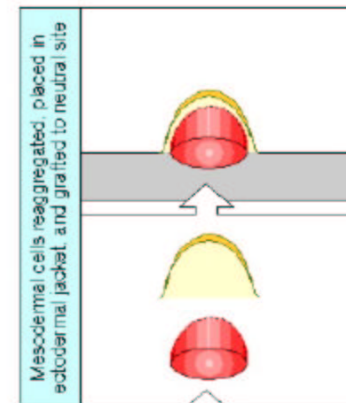
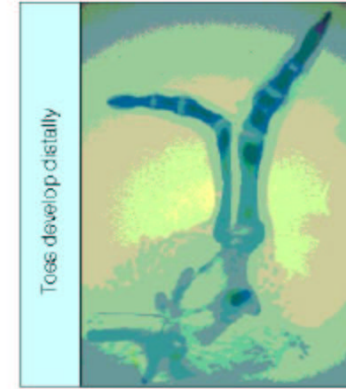
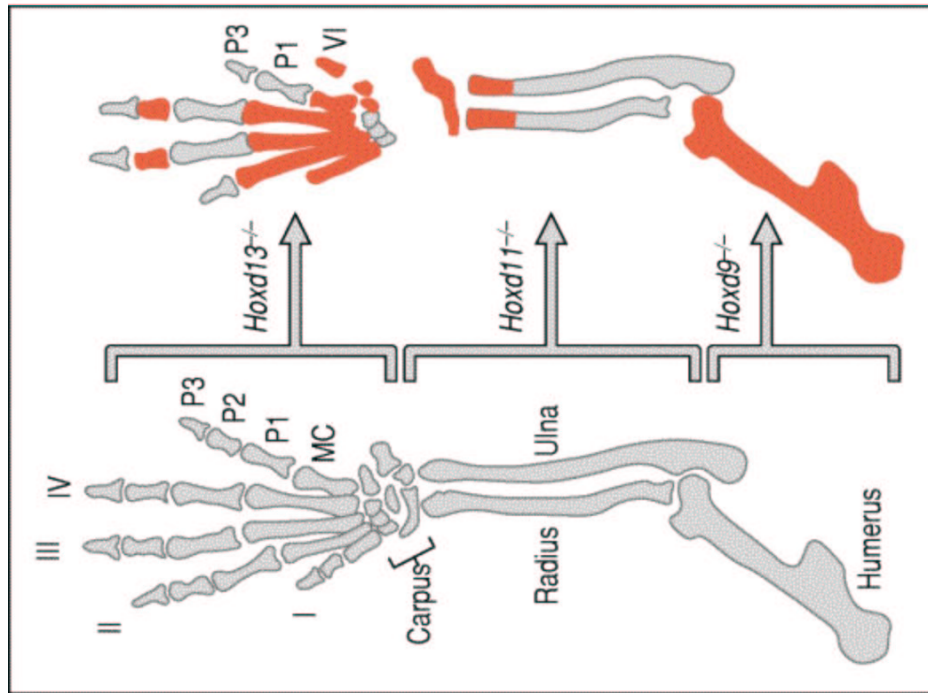


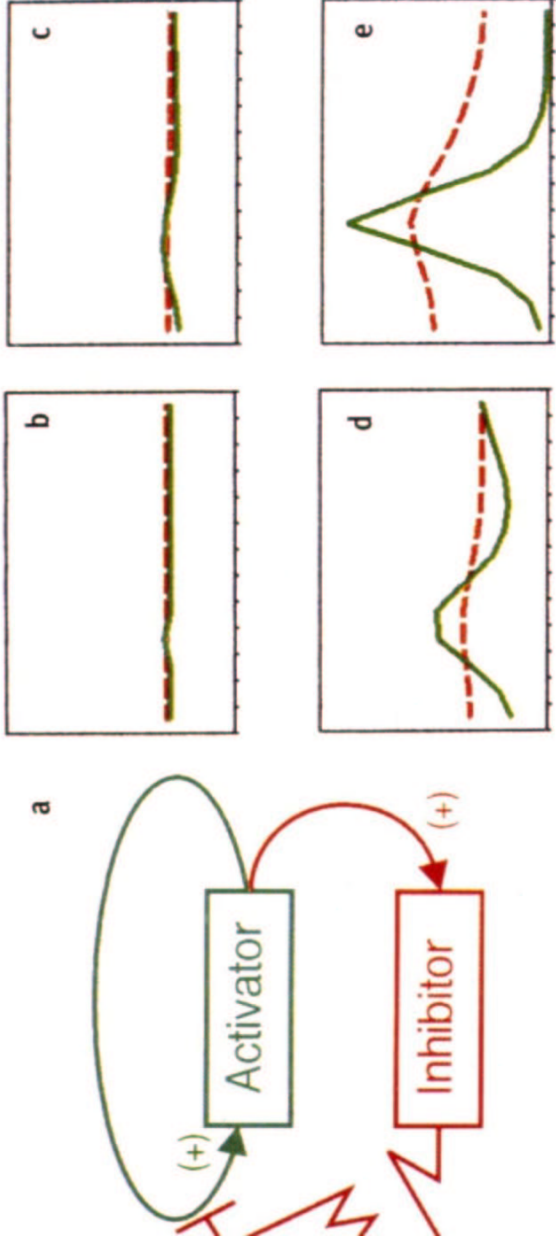
FRACTION DIVIDING CELLS IN PZ











**Figure 2.2.** Pattern formation by autocatalysis and long-range inhibition. (a) Reaction scheme. An activator catalyses its own production and that of its highly diffusing antagonist, the inhibitor. (b) Stages in pattern formation after a local perturbation. Computer simulation in a linear array of cells. A homogeneous distribution of both substances is unstable. A minute local increase of activator (—) grows further until a steady state is reached in which self-activation and the rounding cloud of inhibitor (---) are balanced [S22].

Limb evolution

