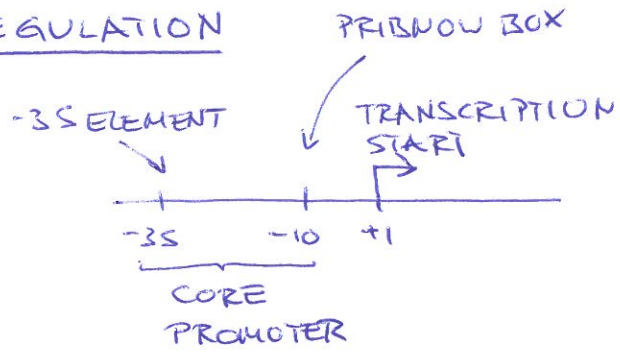
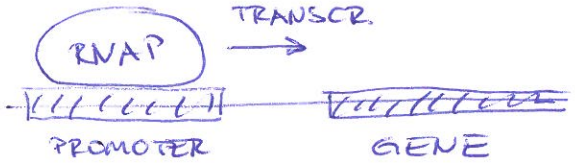
10/8/10

3. GENE REGULATION

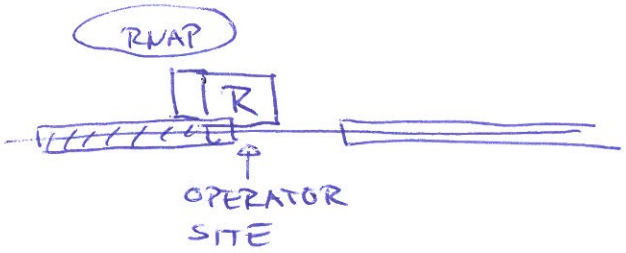


(MINIMAL REGULATORY STRUCTURE)

3.1 TRANSCRIPTION FACTORS

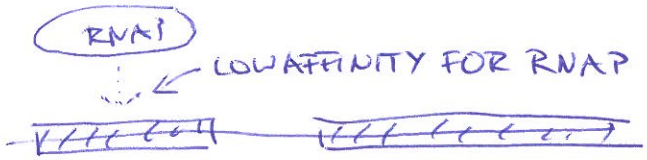


"ON"

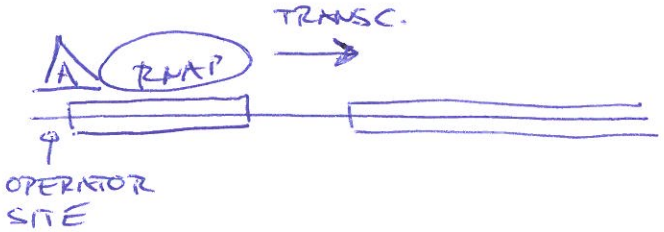


"OFF"

R: REPRESSOR, BLOCKS TRANSCRIPTION



"OFF"



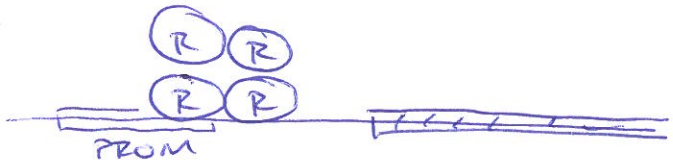
"ON"

A: ACTIVATOR, PROMOTES TRANSCRIPTION

A, R: TRANSCRIPTION FACTORS

(BIND (NEAR) PROMOTER, REGULATE TRANSCRIPTION)

COOPERATIVE BINDING



~~TRATF~~'S OFTEN FORM DIMERS OR HIGHER ORDER COMPLEXES

3.2 GENE EXPRESSION MODELS

NOREGULATION

~~LAST TIME~~ : $\dot{m} = \alpha_m - \gamma_m m$

$$\dot{m} = \alpha_m \frac{g_{ON}}{g_{TOT}} + \alpha_0 - \gamma_m m$$

g_{ON}/g_{TOT} : FRACTION GENE „ON"

α_0 : LEAKY TRANSCRIPTION

REPRESSION:

$$g_{ON} + nR \underset{k_-}{\overset{k_+}{\rightleftharpoons}} g_{OFF}$$

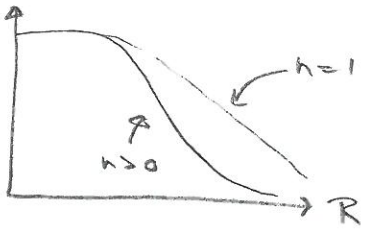
$$\dot{g}_{ON} = -k_+ g_{ON} R^n + k_- g_{OFF} \overset{!}{=} 0 \quad \text{(in EQUILIBRIUM)}$$

$$\Rightarrow g_{OFF} = \frac{k_+}{k_-} R^n g_{ON} = \frac{1}{K} R^n g_{ON} \qquad K = k_-/k_+$$

$$g_{TOT} = g_{ON} + g_{OFF} = g_{ON}\left(1 + R^n/K\right)$$

$$\dot{m} = \frac{\alpha_m}{1 + R^n/K} + \alpha_0 - \gamma_m \cdot m$$

HILL FUNCTION



ACTIVATION:

$$g_{OFF} + nA \underset{k_-}{\overset{k_+}{\rightleftharpoons}} g_{ON}$$

$$\frac{g_{ON}}{g_{ON} + g_{OFF}} = \frac{K A^n}{A^n + K}$$

$$\dot{m} = \frac{\alpha_m A^n/K}{1 + A^n/K} + \alpha_0 - \gamma_m m$$