Biochemical & developmental genetics

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На совещании передовиков урожайности по зерну, трактористов и машинистов молотилок с руководителями партии и правительства. Товарищи **Сталин, Андреев, Микоян** и **Косиор** слушают речь академика **Т. Д. Лысенко.**

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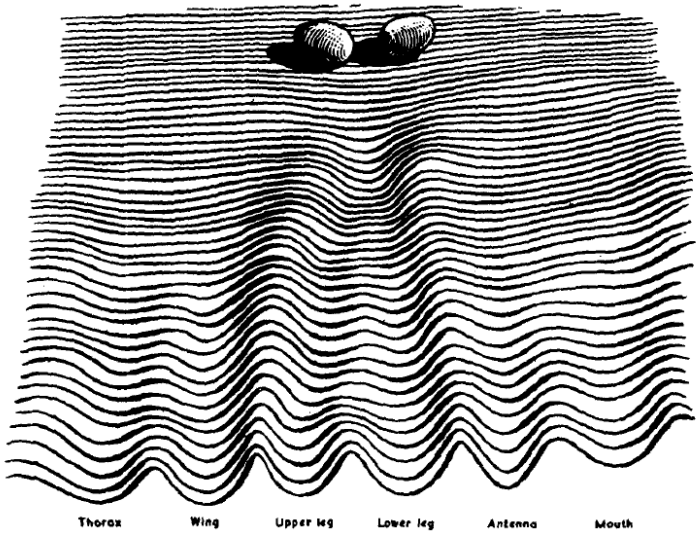
DEVELOPMENTAL GENETICS

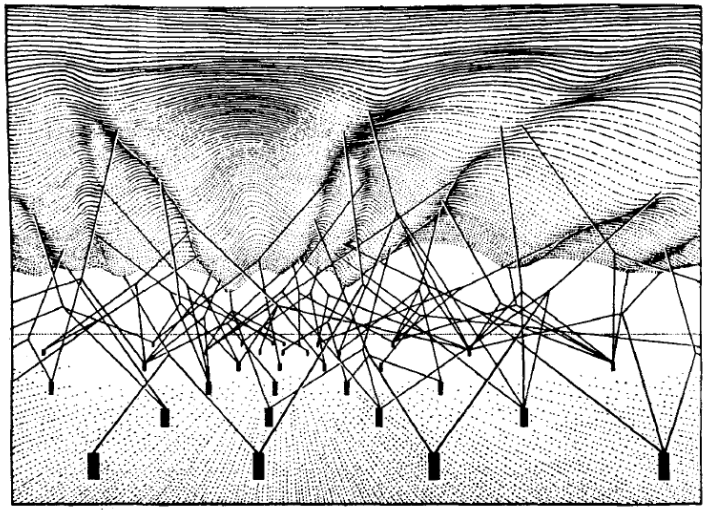
Early in life, each cell is totipotent: it has the potential to differentiate into a number of cell types. But in later stages of development, the type of cell it can become is increasingly restricted. In other words, the cell's determination -- its commitment to a specific fate -- is successively restricted to every-narrowing possibilities.

Development is a continual decision-making process in which cells of a developing organism need to be allocated to different tasks.

Waddington's epigenetic landscape

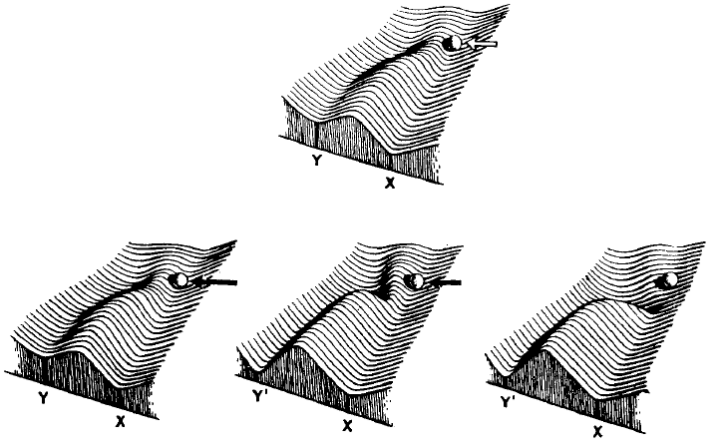


Waddington's epigenetic landscape



Waddington's epigenetic landscape

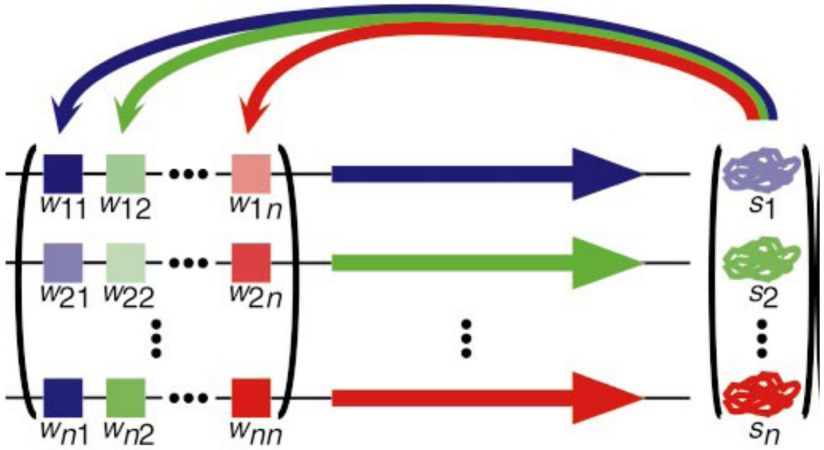
Canalization

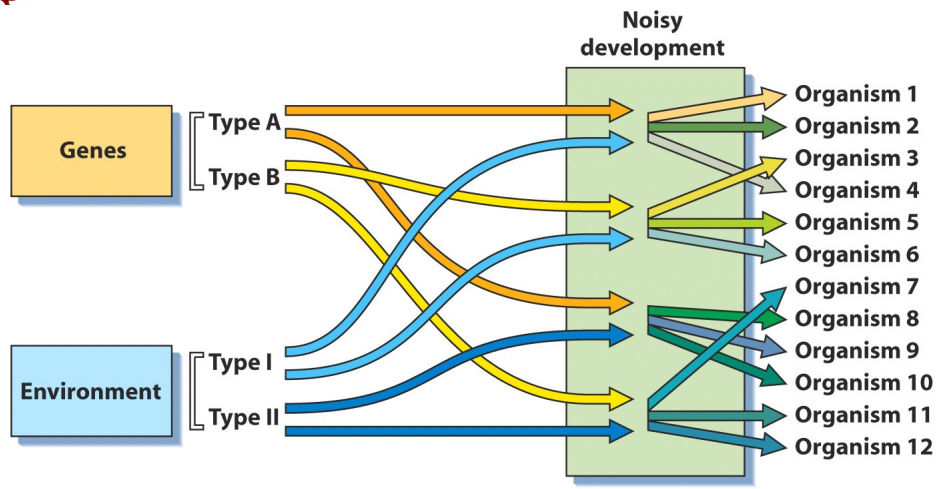


DEVELOPMENTAL GENETICS

The same phenotypes can be obtained by changing different embryological components of a complex trait, i.e., "*developmental homoplasy*"

Feedback here, feedback there, feedback everywhere.





Biochemical genetics

Metabolic control theory

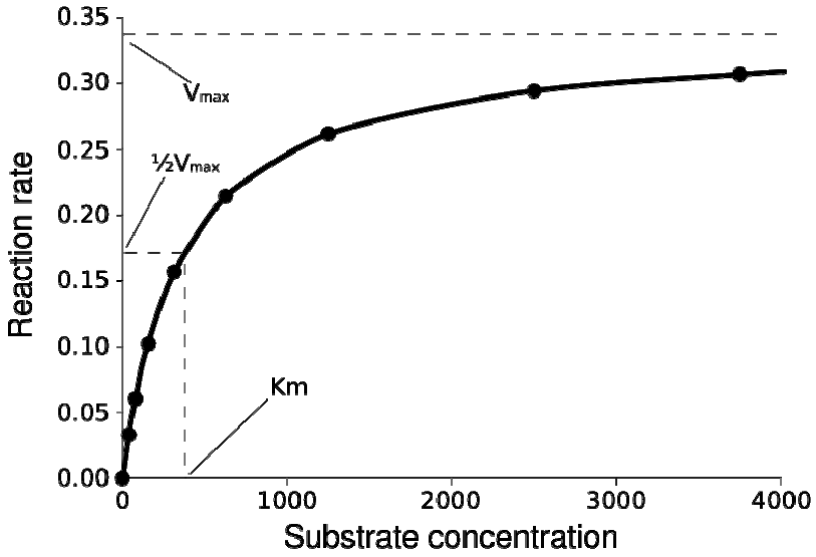
The highly interactive nature of metabolism makes it impossible to assert a simple enzyme-phenotype relationship.

Biochemical and physiological processes underlying all phenotypic manifestations are ‘controlled’.

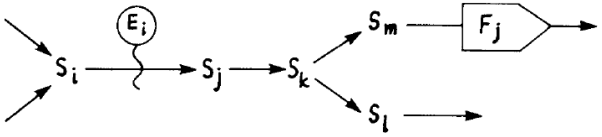
Enzymes are kinetically coupled to each other in pathways and cycles, ...

When as geneticists we are considering an allelic substitution, as biochemists we are considering a change in the rate of an elementary transformation step.

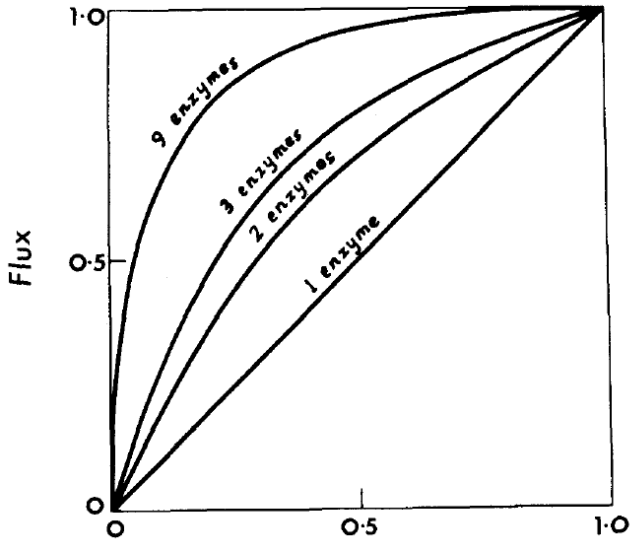
Michaelis-Menten kinetics



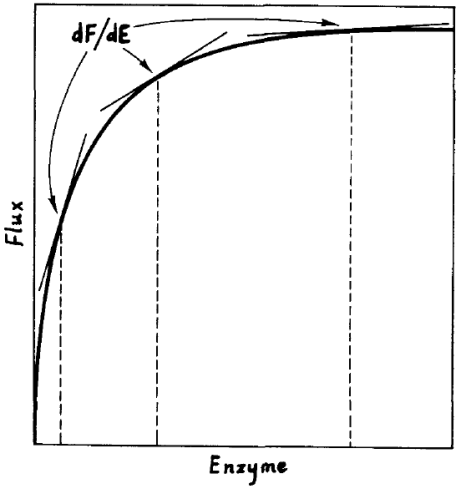
Control coefficients

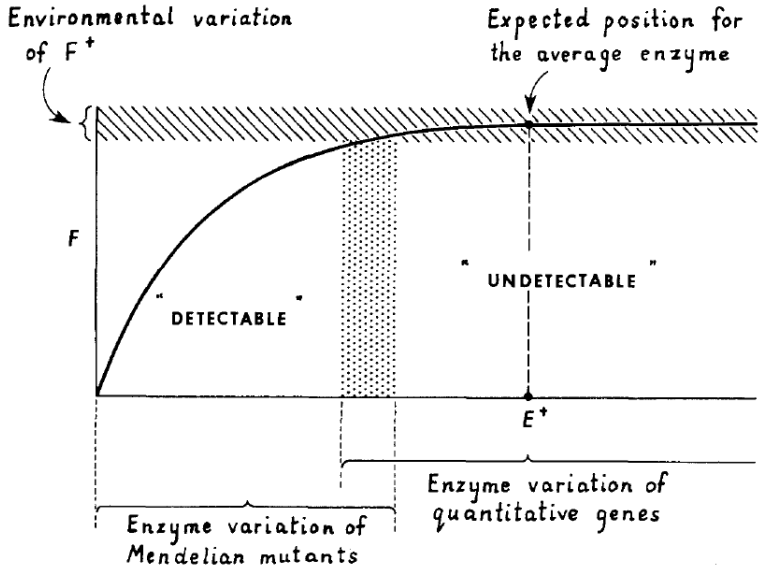


$$\frac{(\Delta J / J)}{(\Delta E / E)} \approx 0$$



$$C_{E_i}^{J_j} = \frac{(\delta \ln J_j)}{(\delta \ln E_i)}$$



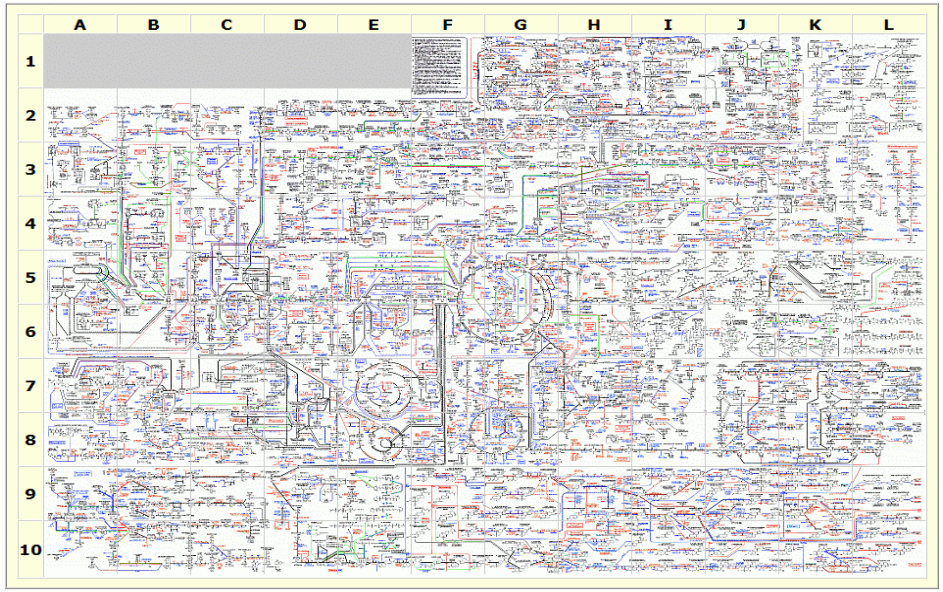


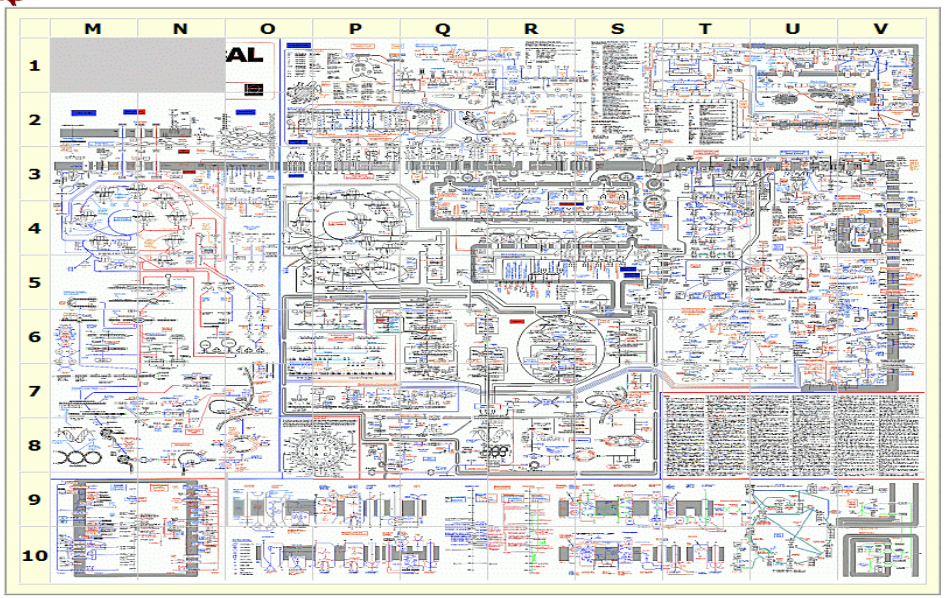
How many genes? One example!

Two pig lines (growth, meat quality)
Phosphorus levels in diet (adequate, deficient, repletion)
RNA samples, oligonucleotide arrays, (over 13000 unique genes)

	Liver	Muscle
Differential expression		
between sire lines	103	339
Dietary treatment	122	18
Interaction	88	31

Grapes et al. (2005)





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