Selection Theory

#### **Chris Kempes**



What are the basic ways in which we think about evolution?

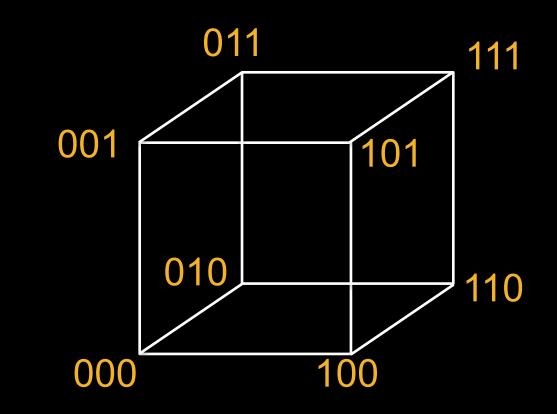


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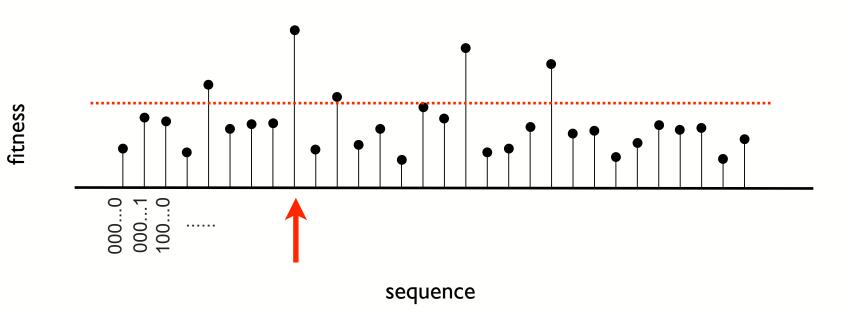


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# **Fitness Landscape**



 $\mathcal{X}_{i}$  Frequency of a given sequence i

 $f_i$ 

Fitness of a given sequence i (e.g. relative growth rate)

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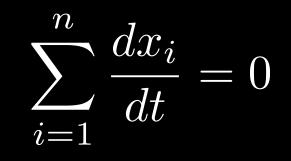
$$\frac{dx_i}{dt} = x_i f_i - \phi x_i$$

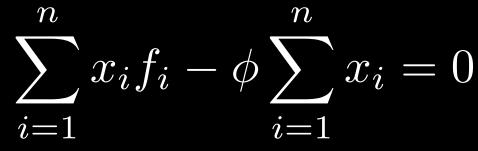
# Quasispecies equation $\frac{dx_i}{dt} = x_i f_i - \phi x_i$

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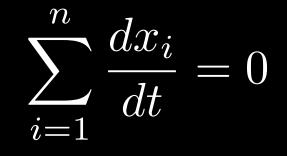
 $\sum_{i=1}^{n} \frac{dx_i}{dt} = 0$ 

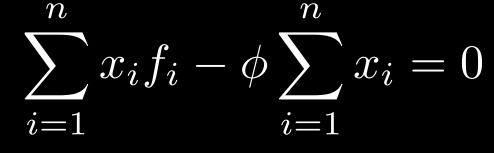
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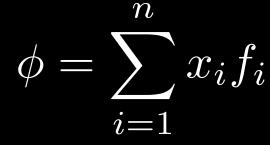




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### **Mutation?**

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 $f_i$  Fitness of a given sequence i (e.g. relative growth rate)

$$\frac{dx_i}{dt} = x_i f_i - \phi x_i \qquad \phi = \sum_{i=1}^n x_i f_i$$

 $q_{i,j}$  Probability of mutating from sequence i to sequence j

n $\frac{dx_i}{dt} = \sum_{j=1}^n x_j f_j q_{j,i} - \phi x_i$ 

