Genome 562

January 2013

Week 2
John Burdon Sanderson Haldane (1892 – 1964)

in the late 1930s

in the 1940s
JBS Haldane’s achievements include ...

- First to make tables of mixtures of gases for deep diving
- First genetic mapping function (the Haldane Mapping Function, 1919)
- Fundamental work in biochemical kinetics
- In population genetics, basic equations for natural selection, migration, mutation
- Pioneered use of likelihood methods in linkage estimation
- One of first two to suggest (with Oparin) that the earth’s early atmosphere was reducing
- Early estimate of rate of mutation of a human gene
- Advised British Admiralty on construction of World War II mini subs
- Science popularizations
Selection with haploids or multiplicative fitnesses

Course of gene frequency change in haploid selection with initial gene frequency $p_0 = 0.01$ and relative fitness 1.2 of the $A$ genotype.
Selection with dominance and recessiveness

Change of the gene frequency plotted against gene frequency of $A$ for cases in which the favored allele is dominant (D), multiplicative (M) and recessive (R). Fitnesses of $AA : Aa : aa$ genotypes were respectively $2.3 : 2.3 : 1$, $5.29 : 2.3 : 1$, and $2.3 : 1 : 1$. 
The course of gene frequency change over 50 generations when fitnesses of $AA$, $Aa$, and $aa$ are $2.3 : 2.3 : 1$ (circles) and $2.3 : 1 : 1$ (squares). Initial frequency of $A$ is 0.02.
The change in gene frequency ($\Delta p$) plotted against the gene frequency in a case of overdominance where fitnesses of $AA : Aa : aa$ are $0.85 : 1 : 0.7$. 
Gene frequencies with overdominance

Convergence of initial gene frequencies from $p_A = 0.99$ and $p_a = 0.01$ to equilibrium when the fitnesses of $AA$, $Aa$, and $aa$ are $0.85 : 1 : 0.70$
Gene frequencies in successive generations when fitnesses of $AA$, $Aa$, and $aa$ are underdominant (1.15 : 1 : 1.3) and the initial gene frequency is 0.65(circles) or 0.68 (squares).
Mean fitness in a case of overdominance

Mean fitness plotted as a function of gene frequency when fitnesses are: \( AA \ 0.55, \ Aa \ 1, \ aa \ 0.25. \)
Course of gene frequency change in a numerical example of a case of alternating Wet and Dry years (lighter lines) and in a case of random Wet and Dry years, independently drawn with equal probabilities. In both cases relative fitnesses of $A$ are 1.5 and 0.6 in Wet and Dry years. The starting gene frequency in both cases is 0.5.