Activity - Heritability

Although the nature vs nurture debate is not a useful way of considering variation, we can find out how much of the phenotypic *variation* in a trait is due to genetic causes and how much of the *variation* in a trait is due to environmental causes. This is where the concept of *Heritability* is important.

Heritability is a tough concept to understand because it relies on you thinking about what causes traits to vary across an entire population, rather than thinking about them in a single individual. Heritability is the extent to which genetic individual differences contribute to individual differences in phenotype. In a statistical sense, heritability can also be defined as:

"The proportion of phenotypic variance attributable to genetic variance"

In an equation, this can be summarised as:

$$H^2 = \frac{\sigma_G^2}{\sigma_P^2}$$

Where H^2 is the broad sense heritability and σ_G^2 is the Genetic variance (variance due to genes), while σ_P^2 is the phenotypic variance (the total variance in the trait). Don't worry too much about the squared sign.... it is there for historical reasons.

If you haven't come across the concept of variance in maths, you can find a summary of this at: http://www.mathsisfun.com/data/standard-deviation.html

It is easiest to think about the concept of heritability in clonal organisms that can reproduce asexually like some plants and many invertebrates. For example, imagine that you grow a clonal strain of wheat in a field, so that every individual has exactly the same genotype. At the end of the growing season, there will be differences in height (σ_P^2) among different plants, but all the differences will be due to local soil, moisture, temperature, and light conditions. Thus, none of the height differences are due to genetic variance (σ_G^2) and heritability will be zero.

If you want a truly epic challenge, you can read about the concept of heritability and its application to evolution at the following links. This is not an easy concept to understand; most first year undergraduates at Cambridge do not *really* understand the concept.

http://www.nature.com/scitable/topicpage/estimating-trait-heritability-46889