

Animal Genetics

study of principles of inheritance in animals

Animal Breeding

application of principles of **animal genetics** with the goal of improvement of animals

3 AREAS IN THE STUDY AND APP'N OF ANIMAL GENETICS

Mendelian Genetics from **Gregor Johann Mendel** (1822–1884), an Austrian monk, experimenting on common garden pea

1865 – describing the **Laws of Particulate Inheritance** (dissertation) principles of transmission of genetic material from one generation to the next

1900 – **Carl Correns** (1864–1933), **Hugo de Vries** (1948–1935), **Erich Tschermak** **rediscovery of Mendel's law**

1901 – produced the first evidence of inheritance with experiments with **chickens**
William Bateson (1861–1926), British geneticist

3 AREAS IN THE STUDY AND APP'N OF ANIMAL GENETICS (cont)

coincidentally, provided the classical definition of **genetics** as a field of study, i.e. as a science dealing with heredity and variation seeking to discover laws governing **similarities** and **differences** in individuals related by descent

leading promoter of **Mendelian genetics vs Biometricians (biological mathematicians)** in the first two decades of the 20th century

coined technical terms such as **homozygote**, **heterozygote**, **allelomorph**

1906 – introduced the terms **gene**, **genotype**, and **phenotype**
Willhelm Johanssen (1857–1927), Danish botanist

3 AREAS IN THE STUDY AND APP'N OF ANIMAL GENETICS (cont)

Population Genetics study of Mendelian genetics in populations of plants and animals

basic foundation: **1908 – Godfrey Hardy-Weinberg Law** **Harold Hardy** (1877–1947), English mathematician

Willhelm Weinberg (1862–1937), German physician

usually limited to the inheritance of **qualitative** characters which are influenced by **only a small number of (major) genes**

study why characteristics become fixed or continue to exhibit variation in natural populations importance: design of selection strategies to increase frequency of **desirable** genes or examples:

Meishan pigs for prolificacy – around 12 offspring

dwarf gene in poultry

3 AREAS IN THE STUDY AND APP'N OF ANIMAL GENETICS (cont)

Booroola gene in sheep for multiple births

double muscling gene in Pietrain pigs and Belgian blue cattle

Quantitative Genetics conceptually the most difficult of the three areas

hypothesis: many genes contribute to expression of traits

effects of individual genes can seldom be seen or measured, e.g. milk yield, growth rate, litter size

complications due to random influence of the environment and other non-genetic factors mask the combined effects of many genes influencing the trait

3 AREAS IN THE STUDY AND APP'N OF ANIMAL GENETICS (cont)

quantitative genetics is the most important of the three areas because: response to selection for quantitative traits generally has much more potential monetary value than those for simply-inherited traits

Ronald Aylmer Fisher (1890—1962), British statistician and geneticist, and **Sewall Green Wright** (1889—1988), American geneticist

Mendelian results: in terms of frequencies of genotypes and phenotypes

biometricians e.e. **Francis Galton** (1822—1911), **Karl Pearson** (1857—1936) results: in terms of correlations and regressions (before rediscover of Mendel's laws)

3 AREAS IN THE STUDY AND APP'N OF ANIMAL GENETICS (cont)

Fischer and Wright: demonstrated that Mendelian frequencies were the basis of biometrical correlations

HISTORY OF ANIMAL BREEDING

started before recorded history with domestication of animals	some cases accidental
	intentional selection for more friendly and tractable animals
	dogs (12,000 years ago)

foundation for progress in selection for quantitative traits	record of performance (ROP)
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	reliable identification system
FATHER OF ANIMAL BREEDING	Sir Robert Bakewell (18th century, 1725—1795)
	Shire horses, Old Longhorn cattle, Leicester sheep

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HISTORY OF ANIMAL BREEDING (cont)

"like begets like" – superior parents are more likely to produce superior progeny than are inferior parents

therefore, "breed the best to the best!"

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