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 – **Laws of Particulate Inheritance** (dissertation)	describing the principles of transmission of genetic material from one generation to the next
	1900 – **rediscovery of Mendel's law**	**Carl Correns** (1864–1933), **Hugo de Vries** (1948–1935), **Erich Tschermak**
	1901 – **William Bateson** (1861–-1926), British geneticist	produced the first evidence of inheritance with experiments with **chickens**

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

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: **Hardy-Weinberg Law**	1908 – **Godfrey 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	reconciled Mendelians and biometricians
Mendelian results: in terms of frequencies of genotypes and phenotypes	
biometricians results: in terms of correlations and regressions (before rediscover of Mendel's laws)	e.e. **Francis Galton** (1822–1911), **Karl Pearson** (1857–-1936)

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)	
	reliable identification system	
FATHER OF ANIMAL BREEDING	**Sir Robert Bakewell** (18th century, 1725–1795)	Shire horses, Old Longhorn cattle, Leicester sheep

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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