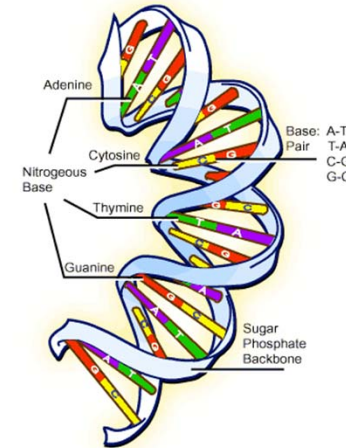
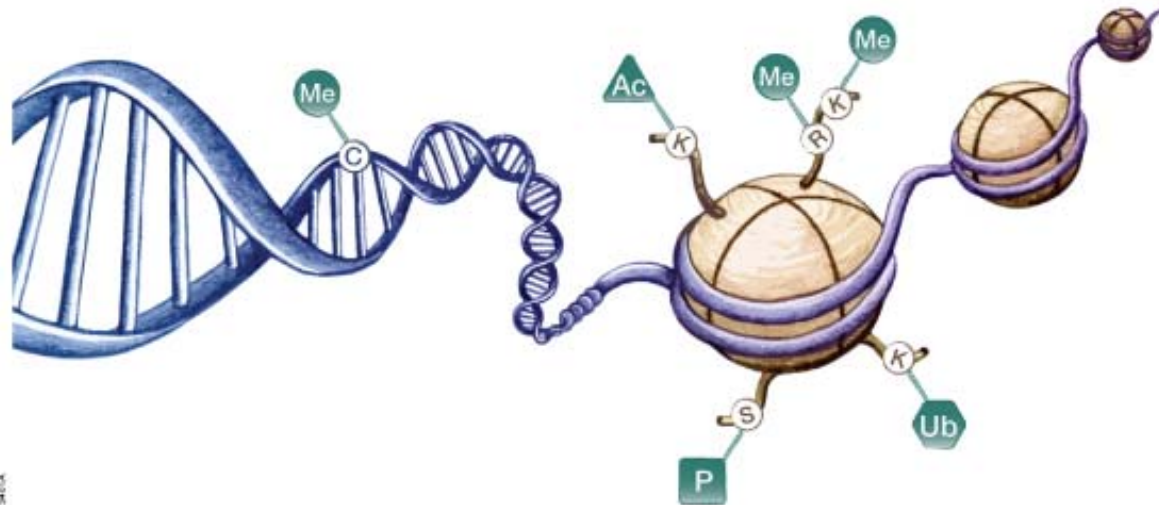


# BEHAVIORAL GENETICS



## Epigenetics



# Dogs

- Sex Differences
- Breed Differences
  - Complete isolation (3<sup>rd</sup> to the 20<sup>th</sup> weeks)
  - Partial isolation (3<sup>rd</sup> to the 16<sup>th</sup> weeks)
  - Reaction to punishment



# DOGS

- Breed Differences
  - Signaling
    - Compared to wolves

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- Pedomorphosis
  - Sheep-guarding dogs



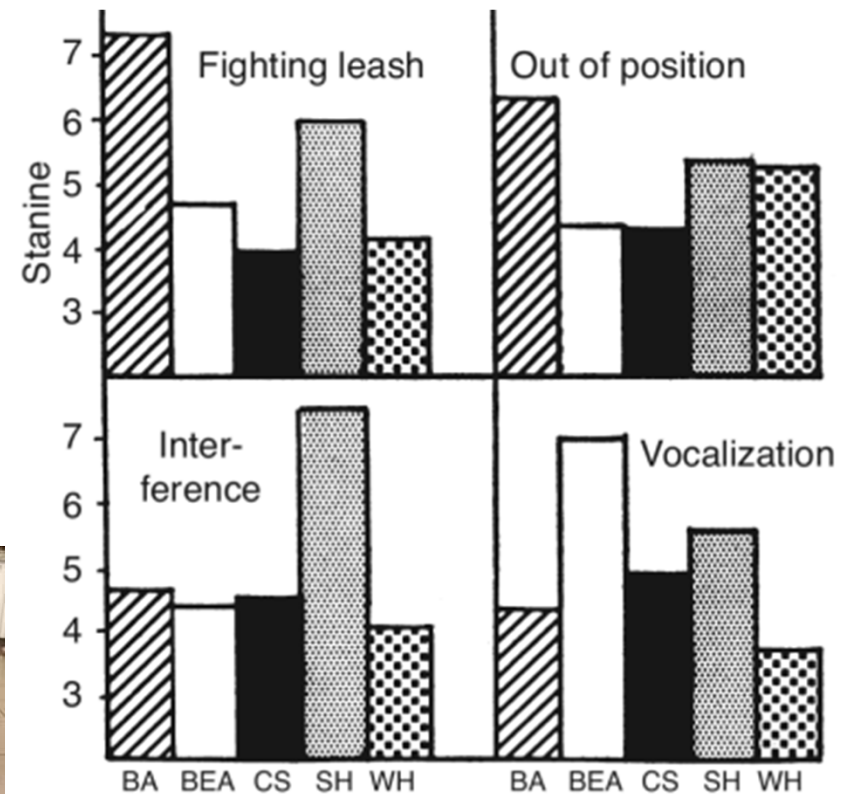
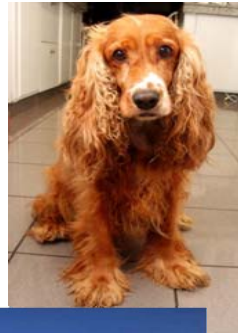
HEELERS > HEADERS-STALKERS > OBJECT PLAYER > ADOLESCENTS





# Dogs

- Breed Differences
  - Learning ability
    - Forced training (CS)
    - reward training (BA)
    - problem solving (BA, BEA, CS)



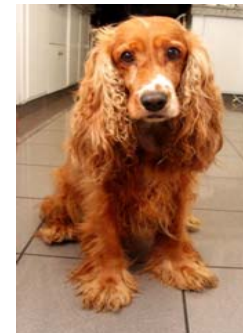
Basenjis (BA), beagles (BEA), cocker spaniels (CS), Shetland sheepdog (SH), wirehaired fox terriers (WH)



# Dogs

## Behavioral Problems

- Separation
- Thunder phobia
- Aggression
  - dominance (ESS)
  - possessive (cocker spaniel)
  - protective (German Shepherd)
  - fear aggression (German Shepherd, cocker spaniel, miniature poodles)



# Dogs

## Potential factors associated with aggression

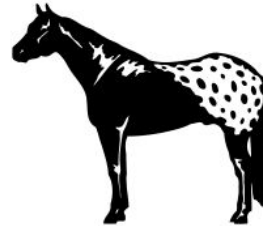
- Area-related genetic difference
  - Dopamine D4 receptor
- Other Neurotransmitter
  - Monoamine oxidase A
  - Serotonin dopamine metabolites
- Gene polymorphisms (breed effects)
  - **Glutamate transporter gene** (Shiba Inu)
  - Tyrosine hydroxylase and dopamine beta hydroxylase gene
- Coat color
- High heritability of aggression
  - Golden retrievers



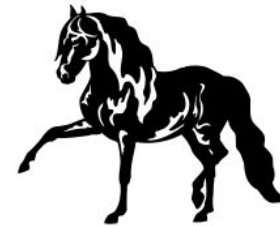


# Horses

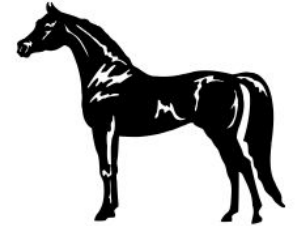
- Breed differences
- dopamine D4 receptor
  - A or G allele?



*Appaloosa*



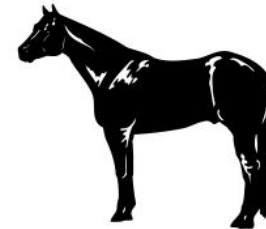
*Andalusian*



*Arabian*



*American Saddle Breed*



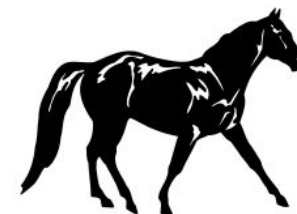
*Quarter Horse*



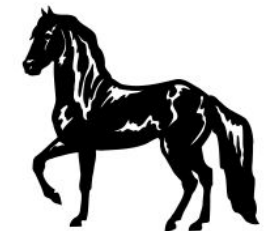
*Peruvian Paso*



*Paint Horse*



*Missouri Fox Trotter*

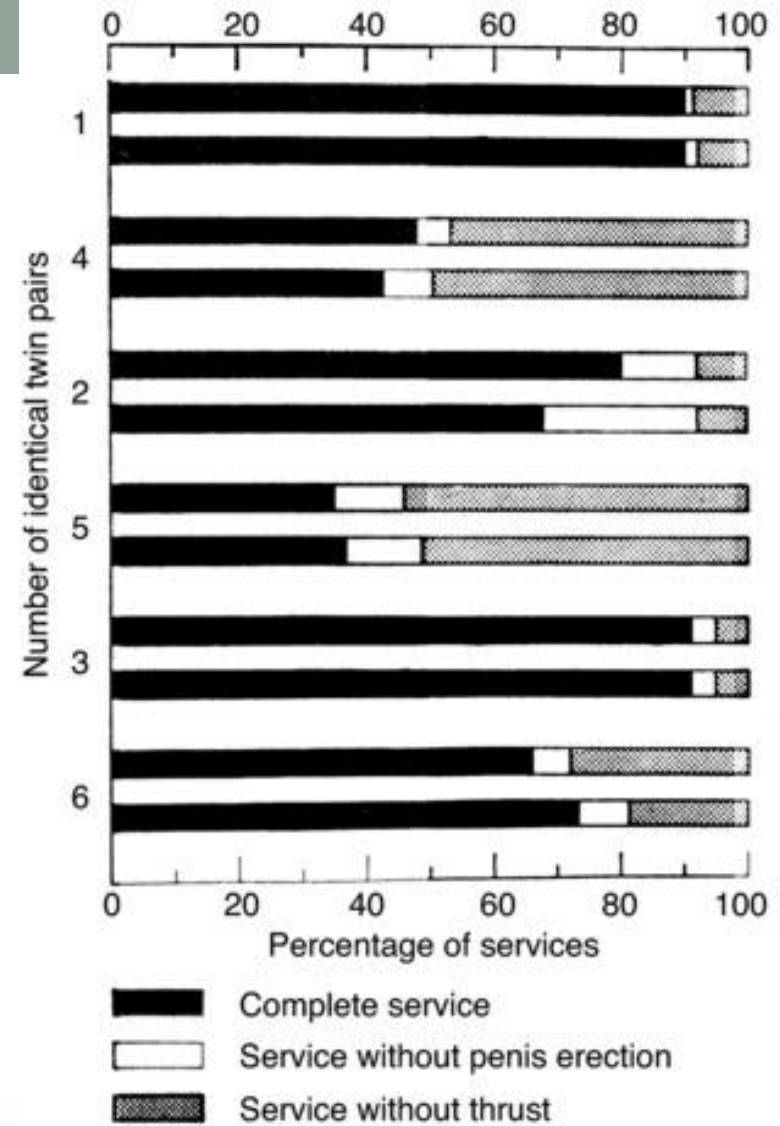


*Paso Finio*



# Cattle

- Social (dominance)
  - Twin cattle
  - Dairy cattle (dairy breed)
  - Temperament (Beef breeds)
  - Genetically determined in heifers
- Sexual activity
  - intraindividual, intrabreed
    - Brown Swiss breeds (least in estrus activity)
    - Black cattle > red/roan/white
    - Male (figure)
- Maternal protectiveness
  - German Angus > Simmental





# Cattle

- Feeding behavior
- Cow graze regions (water)  
Piedmontese vs Angus



- Maximize intake (High bite rate and low mastication rate)  
Holsteins > Norwegian Reds



# Sheep

- Social behavior

- Group size

(Clun Forest sheep > Dalesbred and Jacob sheep)

- Subgroups (Merino < Dorsets and Southdowns)
- Environmental preference (Blackface sheep vs Suffolk ewes)

- Maternal behavior

- Duration of estrus
- Abandonment of one of twin lambs  
(Merino > Dorsets or Romney)
- Maternal behavior
- Ewe-lamb proximity (Suffolk lamb vs Blackface lamb)





# Pigs

- Breed differences

- Aggression







- Yorkshires > Berkshires

- Sexual behavior

- Hampshire males dominance over females > Durocs
  - Yorkshires are easier to train to mount a dummy than Durocs
  - Poor libido (Landrace > large white breed )

- Maternal behavior

- decreased nursing intervals by playback of nursing calls in [Meishan](#) but not Yorkshire and Landrace pigs

Selected breeds of pigs					
	name	use	distribution	characteristics	comments
	Berkshire	meat	U.K., Japan, Australia, N.Z., South America	medium-sized; black with white feet, face, and tail tip	raised for pork and bacon in different areas
	Duroc , or Duroc-Jersey	lard	North and South America	medium length; light gold-red to dark red	1/2 Jersey Red, 1/2 Duroc
	Hampshire	meat	U.S. breed	medium weight, long body; black and white forelegs and shoulders	active, alert, good grazer
	Landrace	meat	north and central Europe and U.S.	medium-sized; white, often with small black spots	several breeds; raised for bacon
	Spotted	meat	developed U.S.	black and white spotted (ideally 50/50)	sometimes called Spots
	Yorkshire (in England, Large White)	meat	worldwide distribution	white, sometimes with dark areas	a bacon breed; sows are prolific





# 9 Behaviour Genetics of the Domestic Pig

Anna K. Butters-Johnson<sup>1</sup> and John J. Mcglone<sup>2</sup>

<sup>1</sup>Iowa State University, USA; <sup>2</sup>Texas Tech University, USA

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# Canine Temperament Tests



- What traits are beneficial in...?
  - Guide and military dogs.
    - mental stability, willingness to please, affability, and defensive drive
  - Hunting dogs.
    - eagerness to hunt, speed, style, independence,
    - seeking width, cooperation, and ability to work in the field
  - Animal-assisted therapy dogs.
    - Least aggression, activity level
    - ability to obey commands
  - Pet dogs.



# Porcine Temperament Tests

- The Back Test/tonic immobility test (useful < 2 month age)
  - High Resistance
    - Approach people or venture out of their pens at 2 month of age
    - More aggressive when mixed if they are dominant
  - Low Resistance
    - Higher lean growth
    - Higher baseline cortisol level and gain more weight after puberty

Large white pigs vs Landrace pigs





# Porcine Temperament Tests

- Aggression, Sociability, Exploration
  - aggression to an intruder (latency to attack)
  - social dependence
  - response to novelty
- Anxiety or fear
  - Eating from ball rose from the through
  - Maze test
  - Approach human/ novel objects
- Activity
  - In an open field or novel environment
  - Enrichment



# Bovine Temperament Tests

- Approach to novel objects or people. (similar as in ovine)
  - Individual difference
- Leading, restraining in a corner and stroking.
  - Genetic (0.22) and environmental effects in docility (indoor vs outdoor)



# Bovine Temperament Tests

- Auction ring
  - stand still/ walked/slowly trotted/try to escape
  - Holstein vs beef cattle
- Cattle in a chute and speed of leaving
  - is correlated with the response to social separation





# Feline Temperament Tests

- Conditions of testing
- Cat personality characteristics



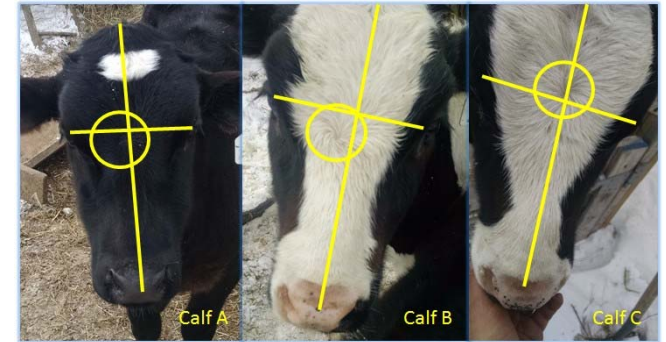
# Equine Temperament Tests

- Mackenzie's test
  - measure reaction to frightening stimuli
- Diet
  - (High protein or fiber diet vs higher starch/sugar diet)
- Personality (handicapped vs open jumping)
  - agreeableness,
  - intelligence/curiosity
  - **emotionality/nervousness**



# Laterality or Handedness

- Horse
  - Left-handed
  - Increase with age due to training
  - Thoroughbreds > Standardbred > quarter horses
- Cattle
  - 40% vs 40% vs 20%
  - hair whorls above eye and agitation, flight distance and crush score in chute
- Dog
  - Sex
  - Immunity





# Glossary

- **Pedomorphosis**-the retention by adults of traits previously seen only in the young.
- **Polymorphism**-two or more clearly different phenotypes exist in the same population of a species.
- **Epigenetics**- the study of cellular and physiological trait variations that are not caused by changes in the DNA sequence; epigenetics describes the study of dynamic alterations in the transcriptional potential of a cell. Epigenetics explains why some traits show a genetic X environment effect; for example: Angus cattle vs Brahma cattle in warm and cold environments (Angus do better in cool climates; Brahma cattle do better in warm)

