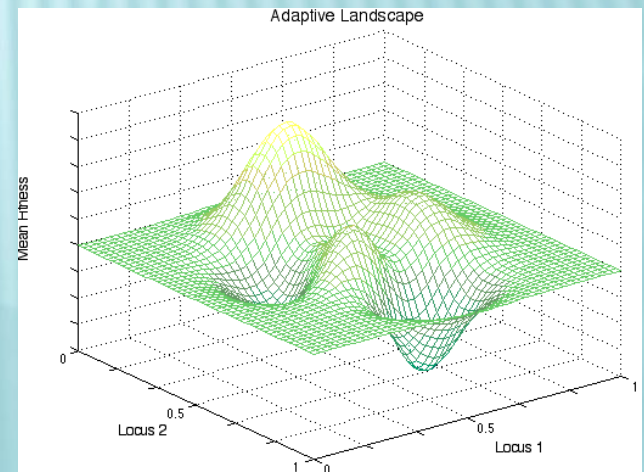
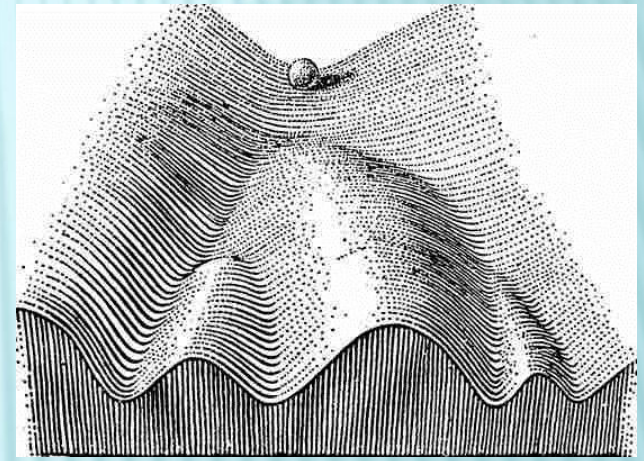


The New Nature vs. Nurture Discussion in Purpose Bred Working Dogs

DEVELOPMENT AND EPIGENETICS

HISTORY

- × Nature vs. Nurture- a long argument
- × Lamarck
- × Darwin
- × Waddington
- × Beilharz
- × Champagne and Meany
- × Coppinger to Crews



DEFINITION

- × Still controversial
- × Different scientific disciplines have different definitions
- × For this discussion
 - + *Trans-generational inherited acquired traits*
 - + *Change in phenotype from genetic structural changes that do not affect the DNA sequence*
 - × *Methylation*

THE WHYS OF EPIGENETIC CHANGE

- × Allows for faster phenotypic change reflective of environmental changes
- × Significantly increases the amount of phenotypic variation
- × Bet hedging through available variation
- × Theoretically enhances survival
- × Could be either adaptive or mal-adaptive

IMPROVING WORKING DOGS- THE PROBLEM

- × Input
 - + Best genes- IBC's, EBV, Quantitative Trait selection, Heritabilities, Pedigree
 - + Many good working models
- × Throughput-
 - + Development
 - + Learning
 - + Training
- × Output-
 - + Working candidates
 - + Breeders
 - + Excess

STAGES OF IMPRESSIONABLE THROUGHPUT IN CANINES

- × In utero
- × Altricial
- × Maternal litter
- × Independent litter
- × Small social group
- × Individual canine
- × Human canine bond



SUGGESTIVE RESEARCH

- × Effect of Rearing Method on Chukar Survival (Slaugh et.al.)
- × Trigger for Brain Plasticity Identified: Signal Comes, Surprisingly, from Outside the Brain.
- × Epigenetic Programming by Maternal Care (Micheal J. Meaney, Behavioral Epigenetics-New York Academy of Sciences)
- × Odor-associative Learning and Emotion: Effects on Perception and Behavior (Rachel S. Herz)
- × Reversal of Maternal Programming of Stress Responses in Adult Offspring through Methly Supplementation: Altering Epigenetic Marking Later in Life (Weaver et. al.)
- × In Search of the Neurobiological Substrates for Social Playfulness in Mammalian Brains.(Siviy and Panksepp)
- × Absolute Pitch: An Approach for Identification of Genetic and Nongenetic Components (Baharloo et. Al.)

ARTICLES SUGGESTING EPIGENETIC CHANGE

- ✘ Association of polymorphisms in the dopamine D4 receptor gene and the activity-impulsivity endophenotype in dogs
(K. Hejjas, et al)
- ✘ Canine Olfactory Receptor Gene Polymorphism and Its Relation to Odor Detection Performance by Sniffer Dogs
(Anna Lesniak, et al)
- ✘ Prenatal olfactory learning in the domestic dog (Deborah L. Wells and Peter G. Hepper)
- ✘ The Effect of Early Separation from the Mother on Pups in Bonding to Humans and Pup Health (Slabbert and Rasa)
- ✘ Observational learning of an acquired maternal behavior pattern by working dog pups: and alternative training method.
(Slabbert and Rasa)

APPLICATION- CANINES ARE A HUGE SOURCE OF PHENOTYPIC VARIATION



APPLICATIONS- CANINES HIGHLY SUSCEPTIBLE TO LIKELY EPIGENETIC CHANGES

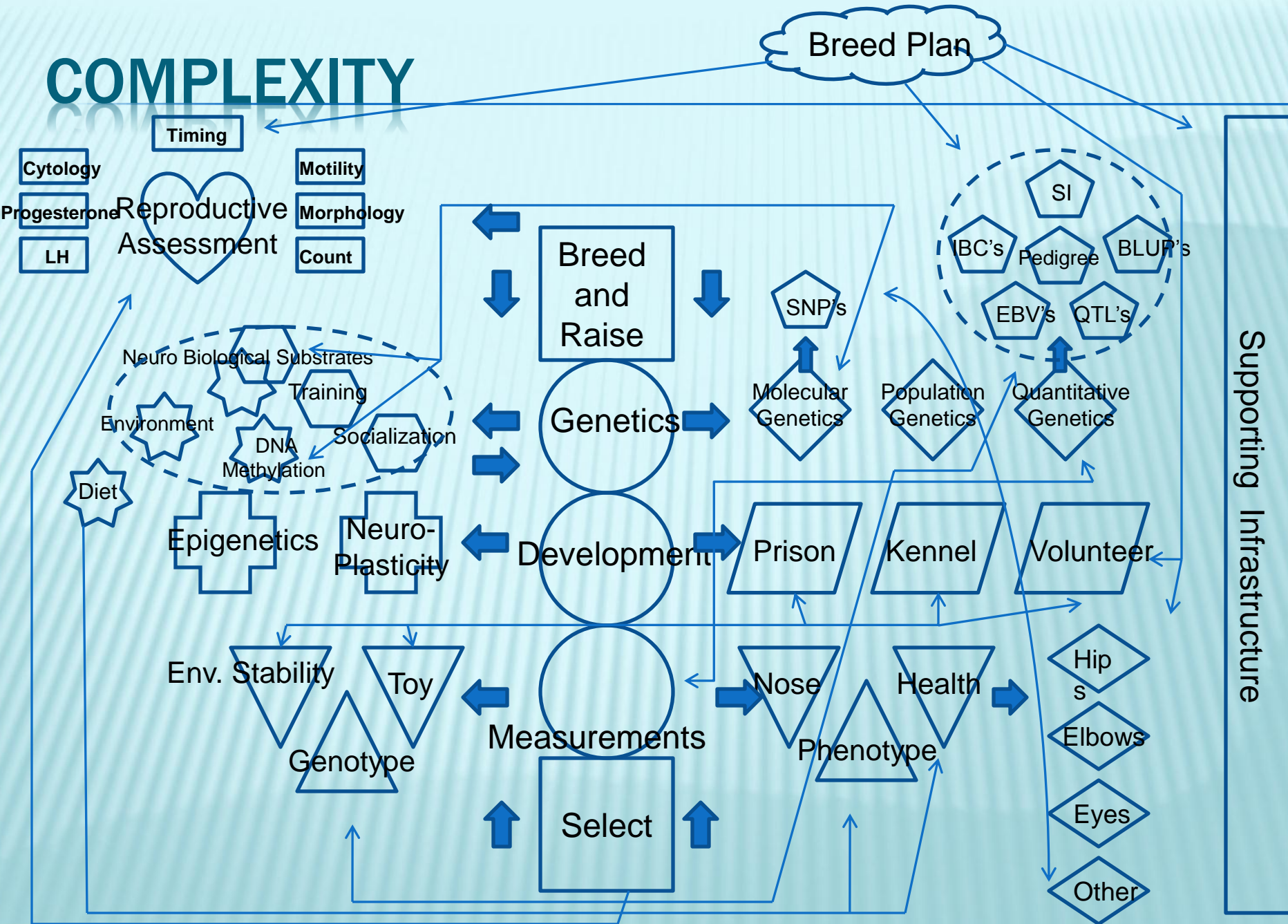
- + Maternal care
- + Play
- + Altricial development
- + Highly social animals
 - × Social cognition
- + Critical periods of development
- + Significant range of behavioral phenotype in species
- + Litter size allows for a range of genetic and epigenetic variation
- + Champagne- Cognition, Reward, and Stress
- + Belyaev Foxes
 - × Compacted chromatin



APPLICATION- BET HEDGING

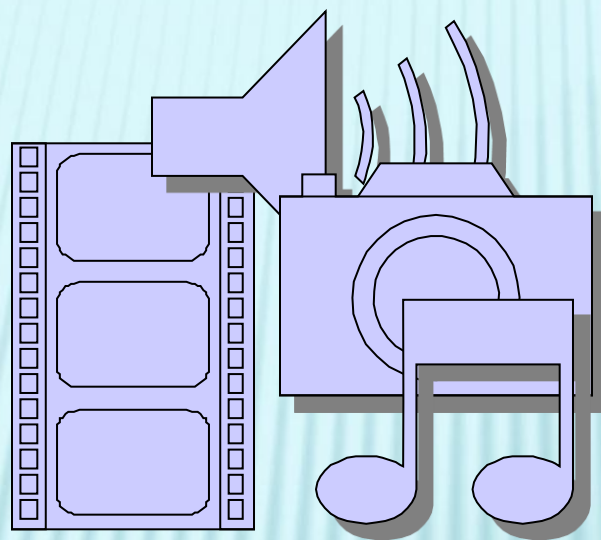
- ✘ We have a good idea of what outcome is desired
- ✘ Interventions can be based on development to persuade outcomes
- ✘ Maintaining working skills in broodstock
- ✘ No 100% single fix, but instead a thousandth of a percentage point adjustments towards a successful working dog.
- ✘ Bistability, Epigenetics, and Bet-Hedging in Bacteria. (Veening, Smits, and Kuipers)

COMPLEXITY

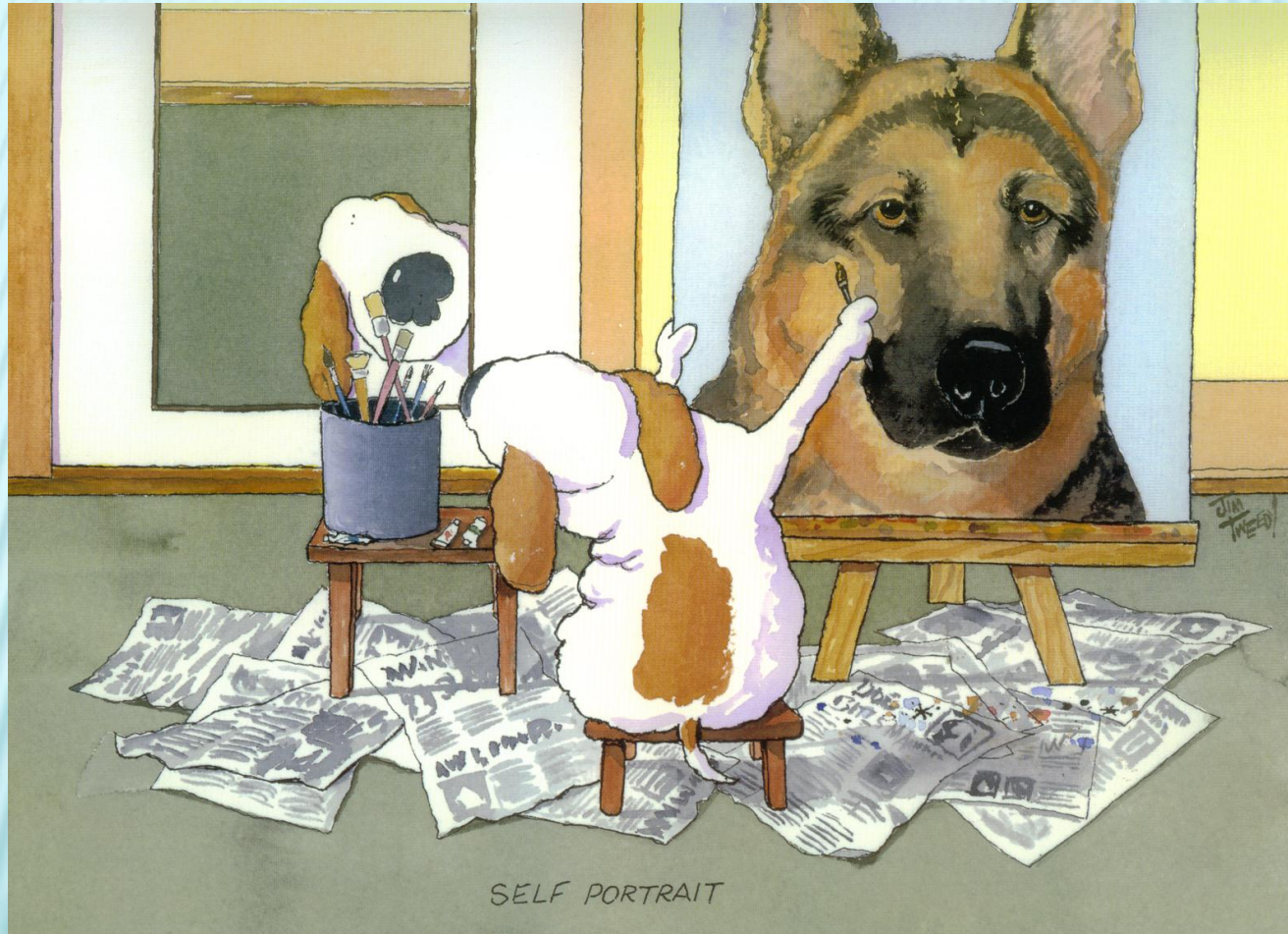


TSA CANINE BREEDING AND DEVELOPMENT CENTER

× Video



THANK YOU AND QUESTIONS



SELF PORTRAIT