

# Chicken Genetics and Reproduction



- The goal of genetic selection in poultry is to produce desirable characteristics.
- Geneticists want to mate the super models and body builders of the chicken world to get the highest quality offspring possible.
- Ideally, the offspring will be better than either parent.
- Similar to when two very attractive movie stars have a child who is even more attractive than either parent.

# The Beginning of Genetic Selection

# Domestication

- The process of taking a group of animals from the wild and, through a process of selection, causing them to become accustomed to human interaction. Domestication usually involves selecting for certain desirable characteristics by breeding two animals with the desirable characteristic.

# Domestication of Poultry

- Before modern production, a number of domesticated varieties of birds existed, each with their own unique qualities.
- The two most common traits that were selected for were egg production and meat production. In some cases birds produced more meat to eat, while others were better for producing eggs, but most birds were good for both egg and meat production.
- Birds that were used for both egg and meat production were known as dual purpose breeds.

# Dual Purpose Breeds



Rhode Island Red





Plymouth Rock



New Hampshire

# Other Qualities

- Other birds were selected for different qualities.
- Examples include: different colored eggs, feathers on their feet, unique color, unique comb shape, etc.

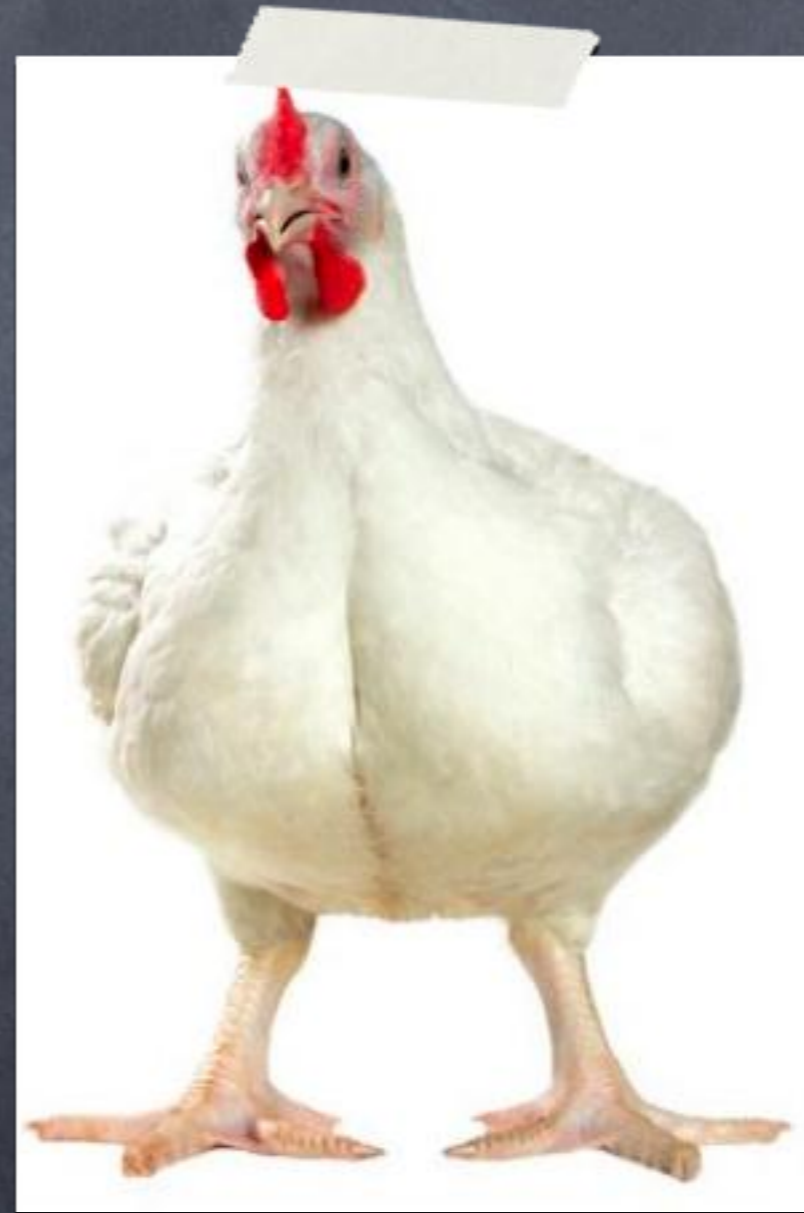


# Transition to Single Purpose

- More recently, birds began to be selected for either meat production or egg production instead of both. These are called single purpose birds.



# Specialization



# Specialization

- Specialization has allowed for much greater advances in egg and meat production characteristics.
- Allows chicken to be an affordable source of protein because of the ability of broiler chickens to gain so much weight with so little feed.
- Also allows eggs to be relatively inexpensive because of the ability of laying hens to lay many eggs in a row.

# Genetic Selection

# Genetic Selection

- Selecting a desirable trait is the first step to genetic selection.
- Desirable traits are different for broilers and laying hens.



# Laying Hens

- Clutch length
- Shell quality
- Sexual maturity
- Size
- Temperament



# Clutch length

- The number of consecutive days a hen lays an egg before taking a break.
- Hens have a natural break that takes place in between egg laying periods.
- The ability to lay a large number of eggs is a highly desirable trait.



# Shell Quality

- A strong shell is necessary for the egg to be transported from the farm to the store.
- Shells are made from calcium, so a bird's ability to absorb calcium and convert it into egg shell is a highly desirable trait.



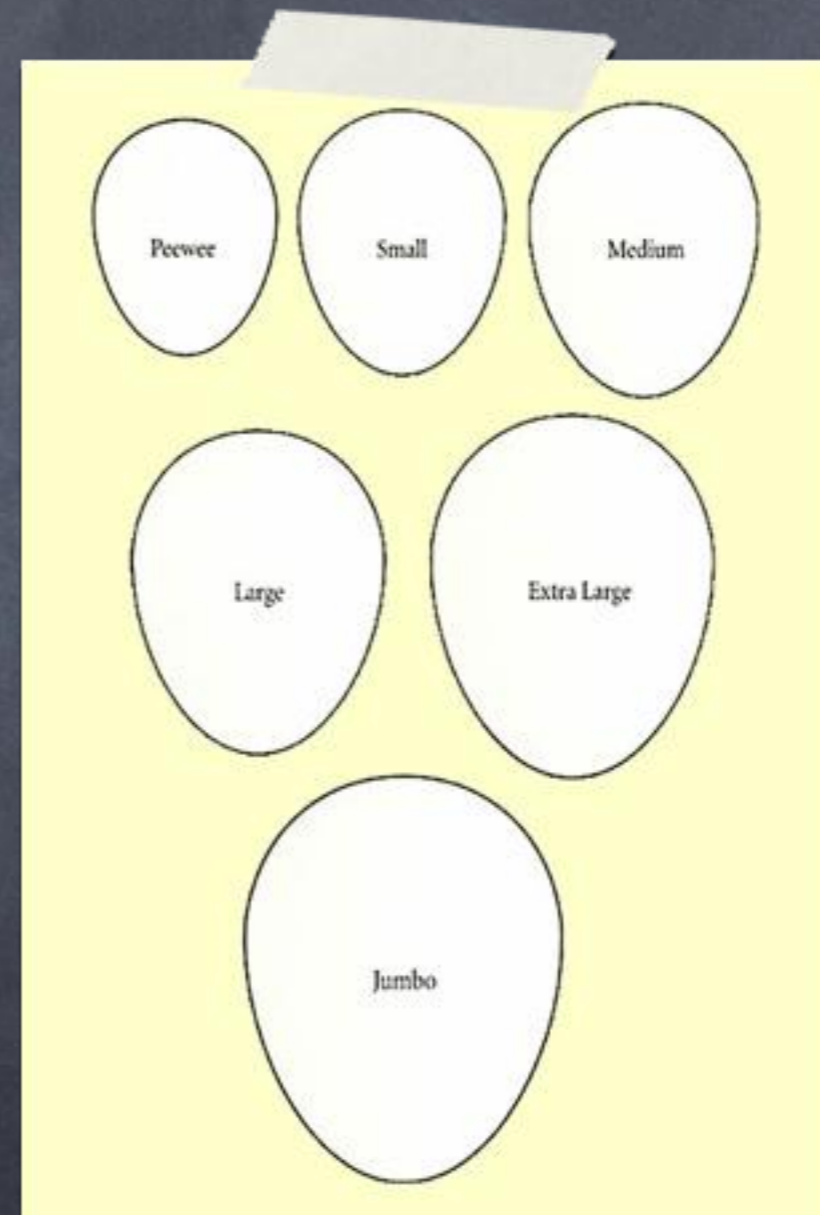
# Sexual Maturity

- The ability of a female chicken to reproduce, or produce eggs.
- With very early maturity, birds will produce eggs sooner in life, increasing a farmers profitability.



# Size

- Size of eggs -- consumers want mostly large eggs. If hens are producing medium or jumbo eggs, the return for producers will not be as high.
- Size of the hen -- a large hen eats too much and a hen that is too small cannot produce large enough eggs.



# Temperament

- Need birds with a good temperament, (birds that are not aggressive) because otherwise they will injure other birds around them by pecking them.



# Broilers

- Growth rate
- Skeletal development
- Resilience



# Growth Rate

- The rate at which a meat bird grows.
- Feed conversion (the process of taking feed and converting it into body weight) is an important aspect of growth rate.





# Skeletal Development

- A strong skeleton is very important to support body weight.
- Bones are synthesized from calcium, so a bird's ability to absorb calcium and convert it into bone development is very important.



# Resilience

- The ability of the bird to withstand disease and other environmental factors.



# Quantifying the Trait

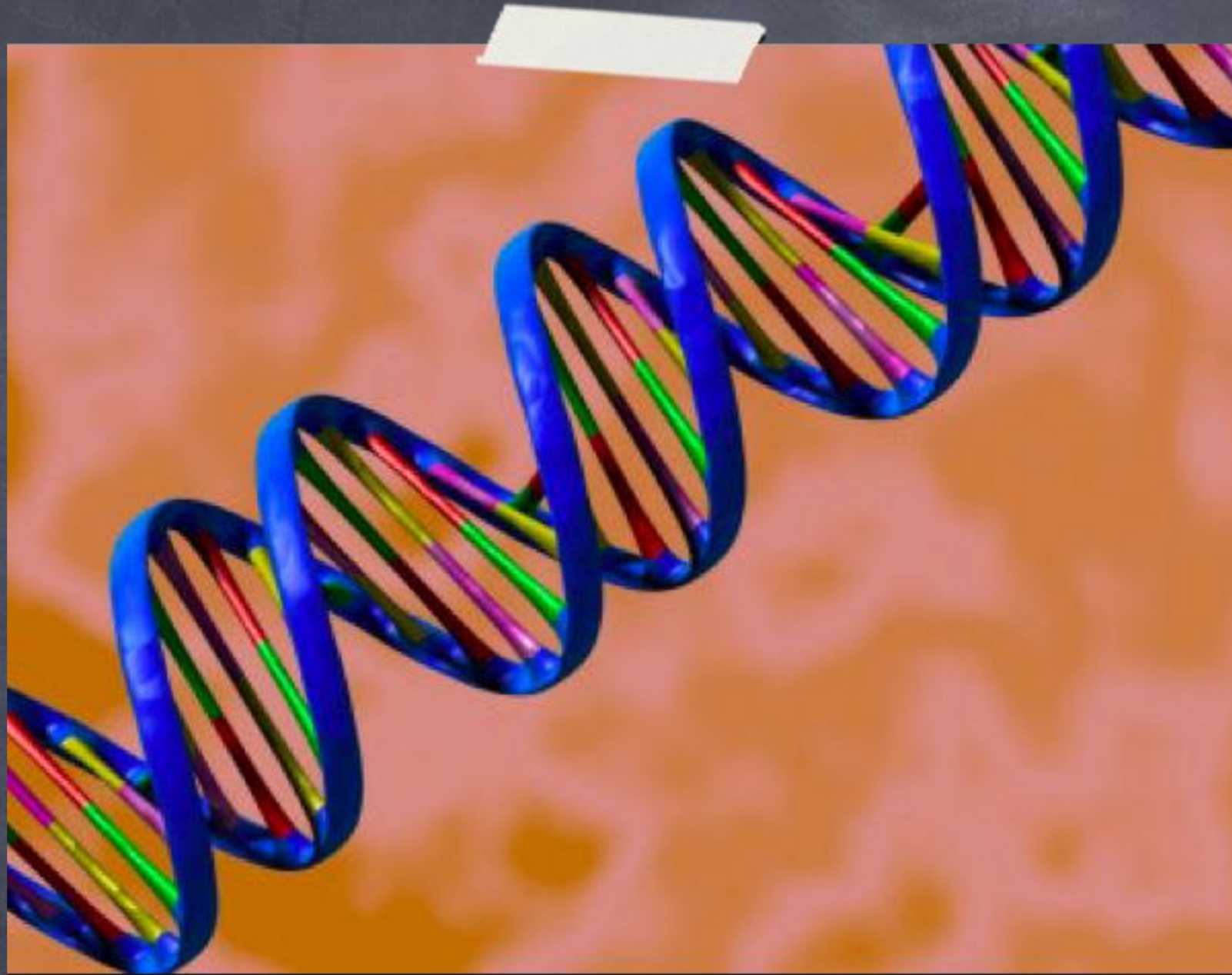
- Quantify -- the ability to measure the quantity of something.
- Traits that are more easily quantified are easier to pass on.

# For Example:

- Selecting for white feathered birds is relatively easy. White feathered birds are easy to see and breed together.
- Selecting for birds with better bone development is much more difficult because bone development cannot simply be observed.

# Heritability

- Some traits are also easier to pass on than others. The ability of a trait to be passed on is known as heritability.
- Traits with high heritability are passed on easily and improve quickly in the population.
- Low rates of heritability take a much longer time to improve within the population.



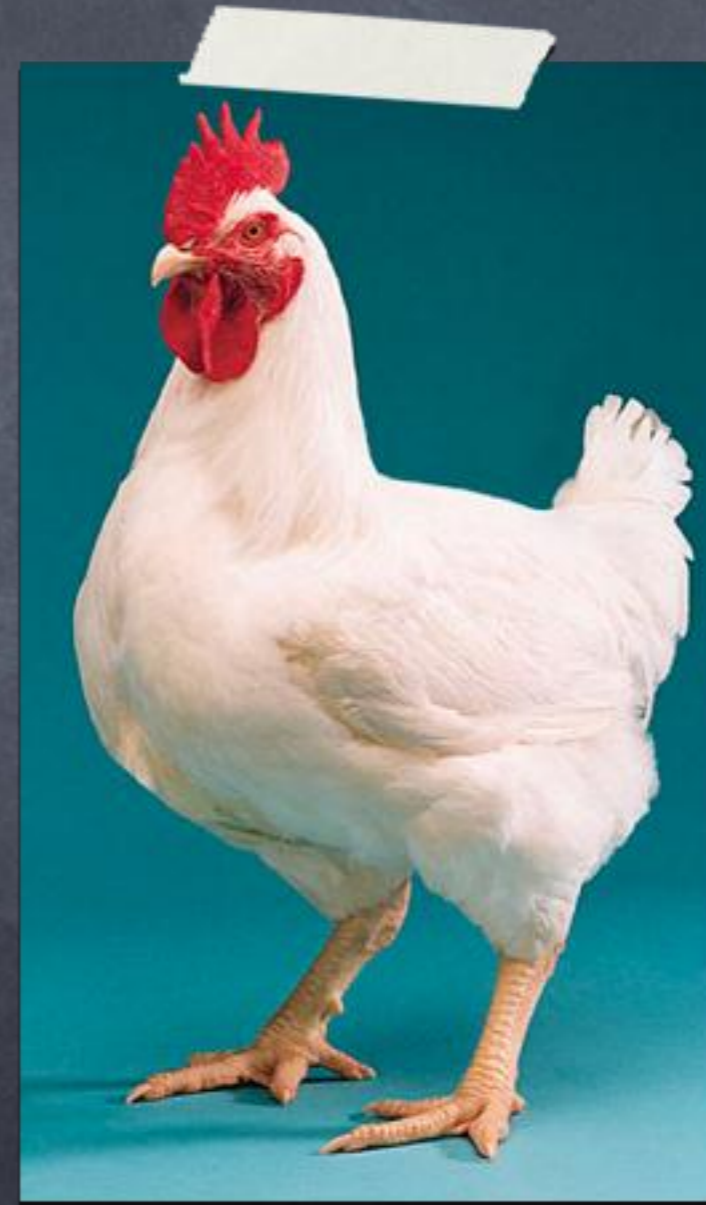
# Genetic Selection and DNA

# Breeding Stock

- Sexually mature poultry of both sexes raised specifically to produce offspring.
- Each bird has genes made up of DNA that give the bird certain characteristics.
- The color of the birds feathers, growth rate, and sex of the bird are all genetically controlled characteristics.
- Breeding stock have genes that give them desirable characteristics.

# Broiler Breeders

- Selected to produce offspring that will have high growth rates and large breasts.





# Layer Breeders

- Selected to produce offspring that will have large clutch size, reach sexual maturity early, and have good shell quality.



# Breeding Timeline

- It takes 5 generations or more to pass a trait down to the eggs and meat that we eat.

