

Introduction - The Origins of Genetics

Exciting time in genetics

Genetic Engineering is full of practical applications and promise

• Bt cotton, & other crops with herbicide and insect resistance, edible vaccines

• oil eating bacteria

• Gene Therapy: 3 little girls alive today because a gene has been added to enough of their bone marrow cells to allow immune function they were born without (ADA deficiency)

• cloning of whole organisms; Dolly the sheep, "Misciplicity" and 2nd Chance (The last 2 are an ongoing dog project and a successful "good bull" project here at TAMU).

• DNA fingerprinting in forensics and disease diagnostics

In order to understand and appreciate the genetic basis of these and many more exciting possibilities made possible in recent years, we first need to understand what genetics is and how it works.

Genetics is the study of heredity; how traits pass from one generation to the next

• patterns of inheritance for simple and complex traits

• molecular basis for storage and expression of genetic information

• effects of mutations: changes in single genes and whole chromosomes

• genes in populations; the basis for speciation and evolution

Genetics accounts for "differences"

between individuals

see <http://www.peterrussell.com/Odds/WorldClock.php> for current human population

between species

see table 2 in <http://www.fathom.com/course/21701746/session2.html> for rates of extinction of species

Origins of Genetics

Recognized as a property of "life", but until 1600's, many believed life could arise from inanimate materials

The Holistic concept that experimentation could not be applied to study natural phenomena began to change when:

- ◇ 1650, Redi kept flies away from meat
- ◇ 1677, Leeuwenhoek invented the microscope
- ◇ 1861 Pasteur introduced sterilization

Early theories of transmission

- ◇ Pythagoras, 500 BC "moist vapor descends and condenses into semen which develops into individual in uterus
- ◇ Empedocles, at the same time assumed the female made a "matching vapor and the two fused.
- ◇ Aristotle, 300 BC assumed vapors accumulate through the blood
- ◇ Leonardi da Vinci in 1500s showed vapor tubes!
- ◇ Leewenhoek, 1683 saw sperm entering eggs

(others claimed to see preformed individuals in sperm!)
- ◇ De Graaf, 1750 recognized mammalian eggs in ovaries, which led to "epigenesis" theories where collected "bodies" in sperm and egg would direct development

- ◇ Lamarck, 1790-1800 suggested the epigenes were shaped by use in parent so that "acquired characteristics" would be passed on (disproved experimentally)

- ◊ 1838-1840 Schleider and Schwan develop cell theory
- ◊ 1859 Darwin proposes evolution and speciation occurs as a result of "selection of the fittest", from differences in the "epigenes"
- ◊ 1882 Flemming describes mitosis
- ◊ 1884 Potential role of chromosomes in heredity realized by Weisman