Symbiosis

Integrating Biology and Statistics at the freshman level-SYMBIOSIS I

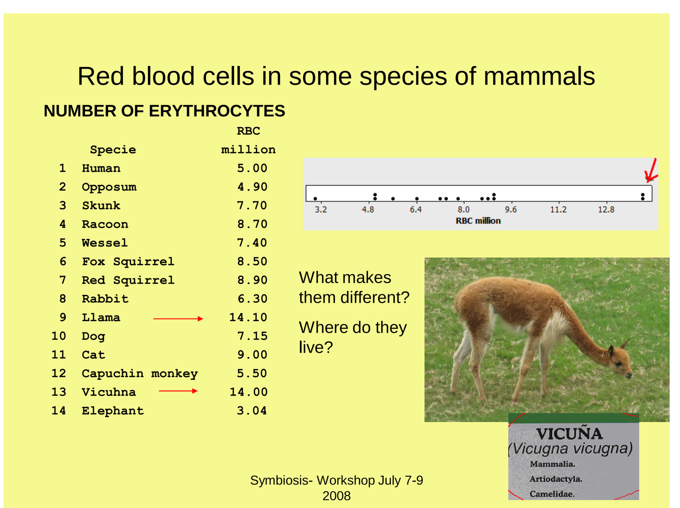
Biology, a good excuse to talk about probability and statistics

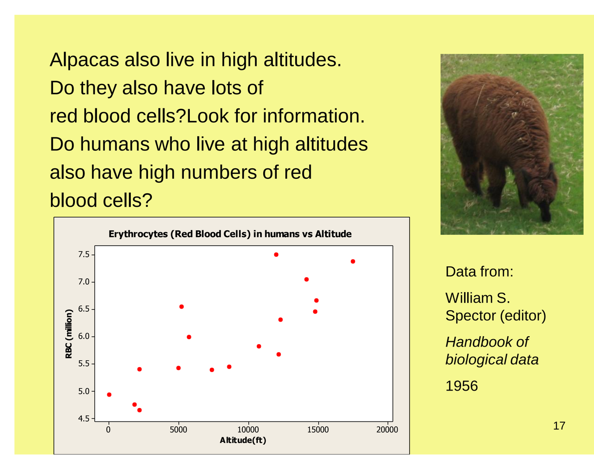
Edith Seier & Karl Joplin
seier@etsu.edu; joplin@etsu.edu
East Tennessee State University

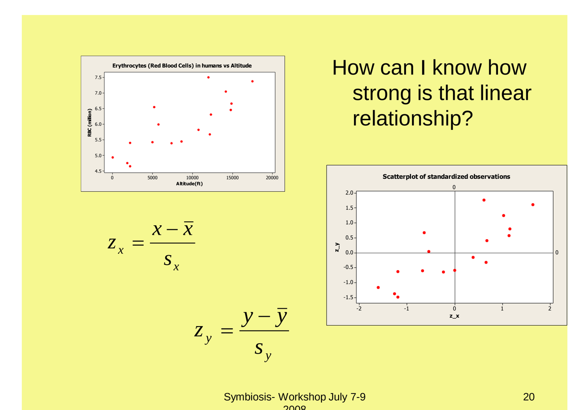
HHMI Grant # **52005872**

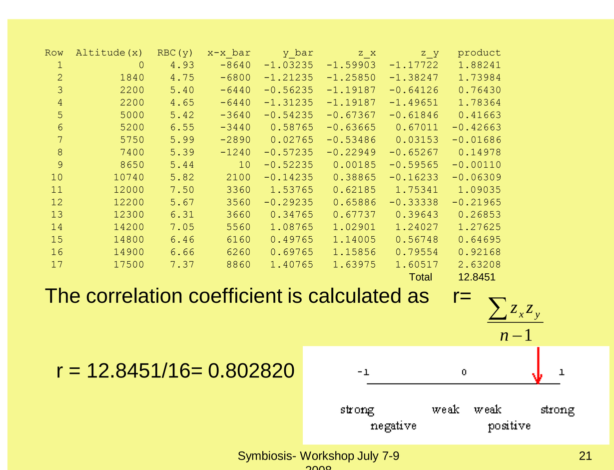
Symbiosis I is the first of a sequence of three Biology, Mathematics and Statistics integrative courses. Students who pass Symbiosis I get credit for Biology I and Introductory Statistics. Since the times of Galton and Fisher, Biology in general, and genetics in particular, have a long history of integration with statistics and probability. Teaching both subjects together in the classroom provides an intuitive approach to both Biology and Statistics. Biological topics provide a motivation for the learning of statistical tools and the results of the application of the latter raise more biological questions. Diagrams and simple probability models help to introduce biological concepts in a schematic and clear way. Statistical methods appear in a natural manner to enhance the biological material.
Some excerpts from the teaching material of Module 2 (Cell and Statistics) and Module 4 (Mendelian Genetics and Probability) are displayed below as examples of the integration of Biology and Statistics in the classroom.

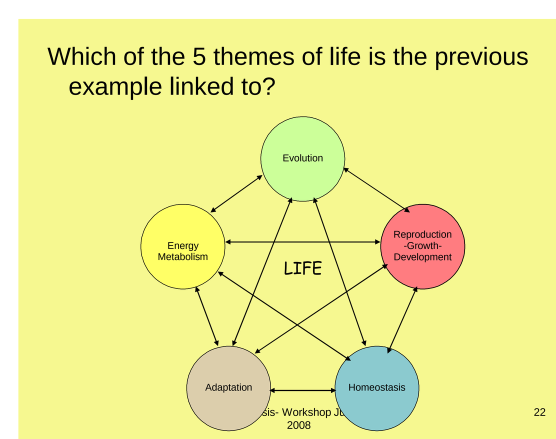
Learning from data



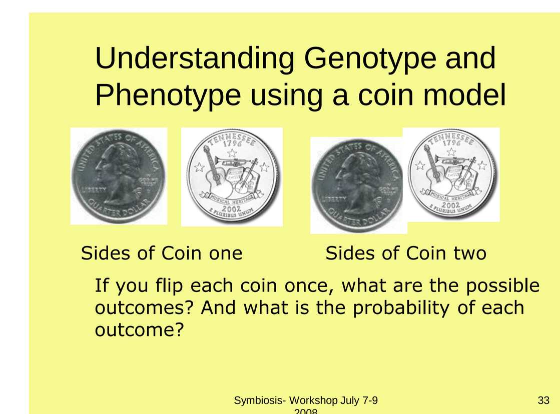


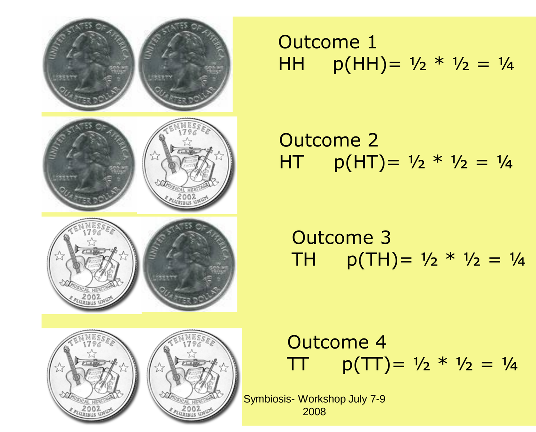


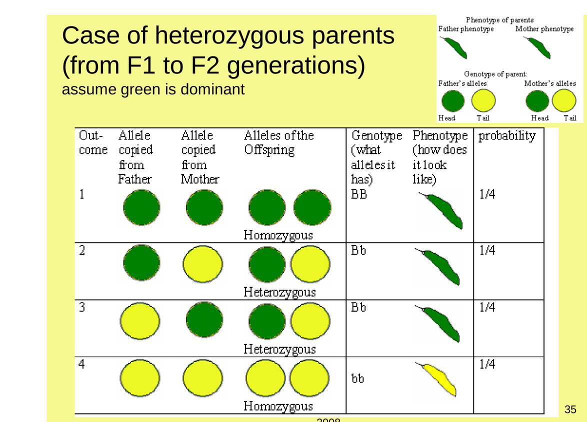


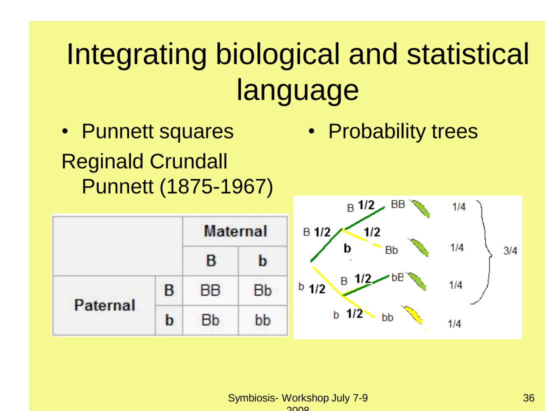


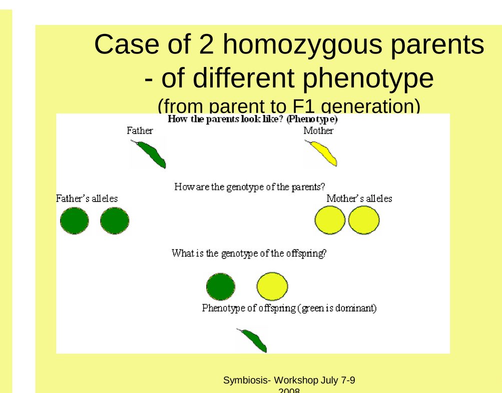
Genotypes and Phenotypes using a coin model

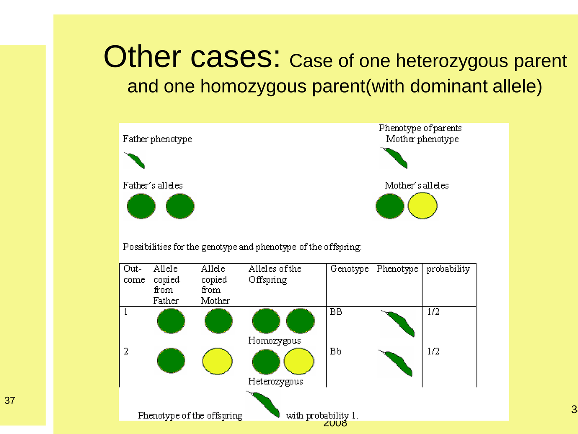


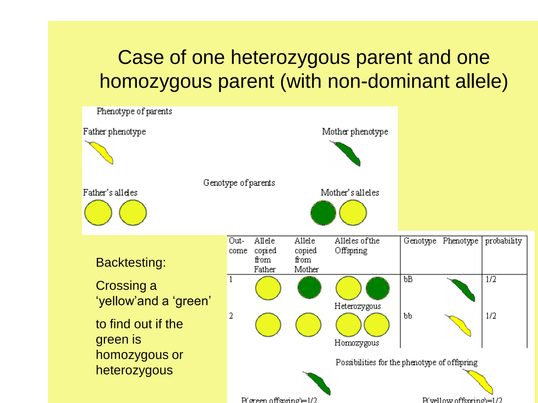




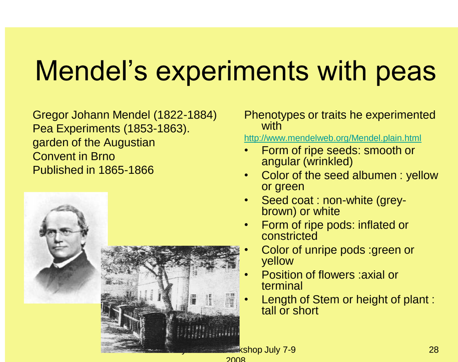


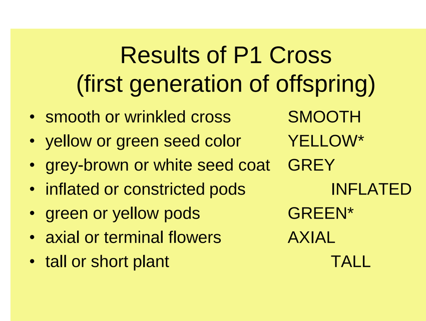


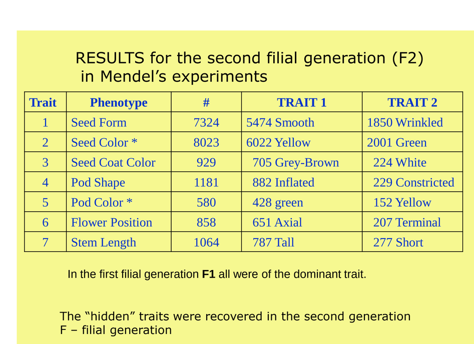


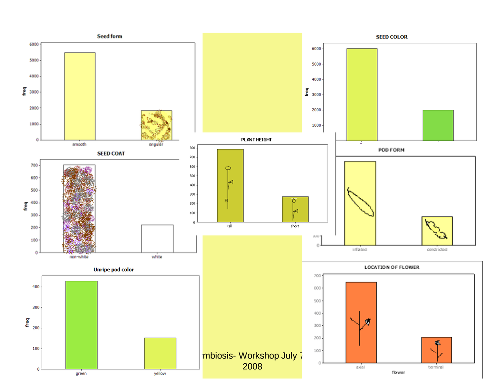


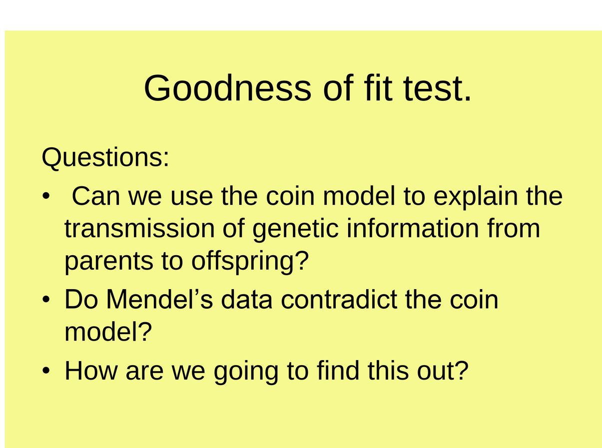
Does Mendel's data constitute evidence against the coin model?

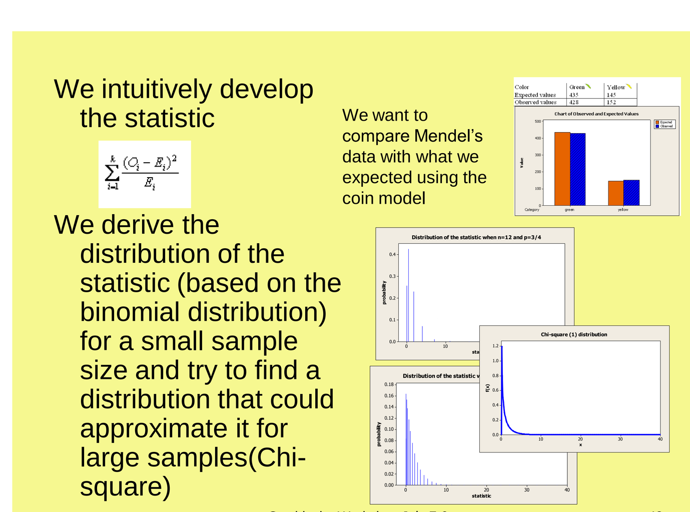


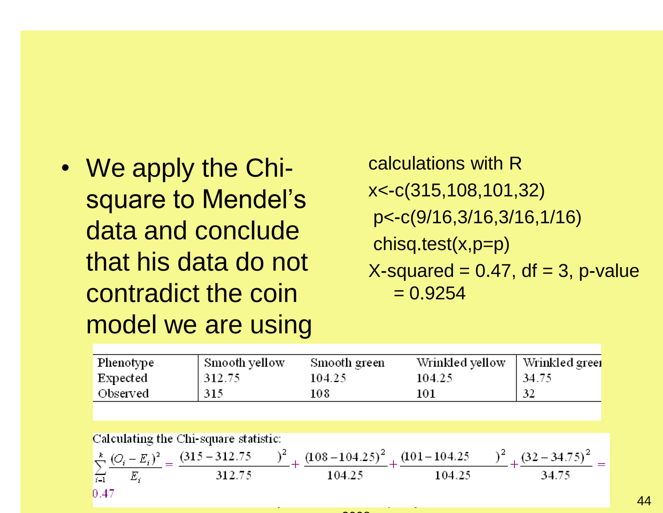












Bayes rule