Why use nonparametric tests at all?

Nonparametric tests **always** have less power than their parametric counterpart because you **always throw out information** by using only rank (and not magnitude) so type II > β

Why use nonparametric tests at all then?

- when used correctly a nonparametric test should give an actual Type I error rate = α

This seems kinda lame, right?

- But if you used a parametric test in its place (which would be using the parametric inappropriately since it doesn't meet the requirements), the parametric test will give a type I error > α

	Parametric	Nonparametric
Assumptions not met	**Type I > α**	**Type I = α**
Assumptions met	**Type II = β**	**Type II > β**

ACTUAL: indicated by Type I, Type II
STATED: indicated by α, β

Modern Statistics Methods

Hypothesis testing

Parametric
t-test
*one sample
*paired
*two sample

ANOVA

Regression

Correlation

Non-Parametric
X^2 GOF

X^2 Contingency

Sign test

Mann-Whitney U

Kruskall-Wallis test

Spearman

Possible Null distributions:

- **Binomial**
- **X^2**
- **Normal**
- **Poisson**
- **F**
- **student's t**

Hypothesis testing

t-test

ANOVA

Regression

Correlation

X^2 GOF

X^2 Contingency

Mann-Whitney U

Sign test

Kruskall-Wallis test

Spearman

But there are many biologically interesting phenomenon that are not easily described by the tools we have examined so far….

Sometimes there is no standard method

Computers have dramatically expanded the toolkit of statistics/research

Computational methods:

- When assumptions of best method available can't be met
  - Random sampling is still assumed
- No standard method exists
- Massive amount of calculations
- When we don't know the null distribution

Sampling distributions:

1. Simulation – hypothesis testing

2. Randomization/permutation (technically chapter 13)

Hypothesis testing

Precision of estimates:

3. Bootstrapping

t-test

ANOVA

Regression

Correlation

Null distributions:

- Binomial
- Normal
- Poisson

X^2 GOF

X^2 Contingency

Mann-Whitney U

Sign test

Kruskall-Wallis test

Spearman

Null sampling distributions:

1. Simulation – hypothesis testing

2. Randomization/Permutation

Precision of estimates:

3. Bootstrapping – sampling distribution of estimate; the values for the parameter estimates that we might obtain and their probabilities. Usually rely on normal approximation for the sampling distribution.