

1. Development of highly quantitative biophysical assays for measurement of behavioral phenotypes

- Current assays are only gross measurements (Morris water maze, T-maze, anxiety tests, pain threshold tests).
- These tests are not sufficiently quantitative to measure subtle behavioral deficits.
- Quantitative behavioral tests are essential in order to precisely define the contribution of a gene to a behavioral output.
- Applicable to mutants with known behavioral deficits - will allow for a better description of the gene's role.
- Also applicable to mutants with no obvious phenotype - new functions may be revealed.

2. Determine the contribution of genetic noise to noise in neural network function.
 - Phenotypic variability among a population of otherwise identical neurons can arise due to stochastic variations in gene expression.
 - This variability has consequences on neuron network function.
 - How is robustness of performance maintained under these conditions?
 - What are the relative contributions of intrinsic vs extrinsic noise in the regulation of neuronal gene expression?
 - Need mathematical modeling and simulation to understand the causes and consequences of these stochastic effects.