

## Coding of attention in temporal cortex

Mike W. Oram

School of Psychology,  
University of St. Andrews

Collaborators:  
NIMH: Z. Lui, B. Richmond, M. Wiener

## Coding of attention

- Basic rationale
- Changes in coarse response measures
  - Firing rates
  - Variability in firing rates
  - Correlation between firing rates
- Changes in fine temporal measures
  - Within neural responses
  - Between neural responses
- Summary

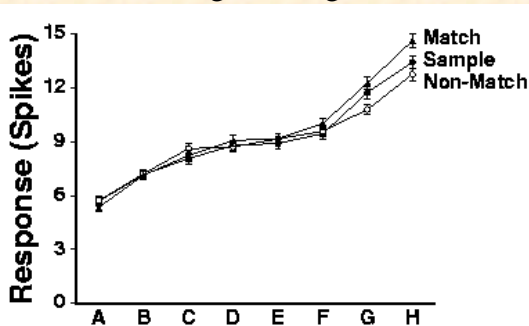
## Delayed match to sample and the neural code

- DMS involves attention
- Attention
  - increases detectability
  - reduces likelihood of false conjunctions
- Effect of attention on the neural code
  - increase in signal-to-noise
  - increase in precisely timed spike patterns

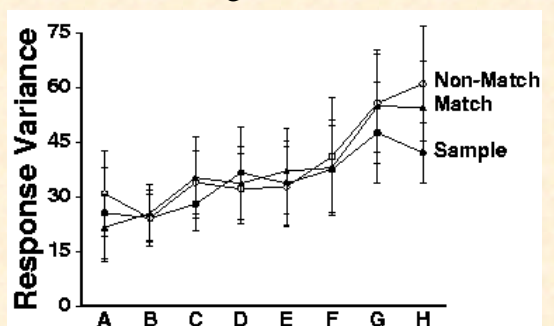
## Measures of responses

- Related to signal-to-noise
  - Mean response (signal)
  - Variability of response (noise)
  - Information
- Related to precisely timed spikes
  - Repeating triplets within responses
  - Repeating triplets between responses

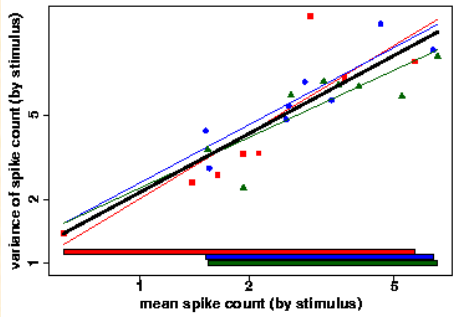
## Changes in signal



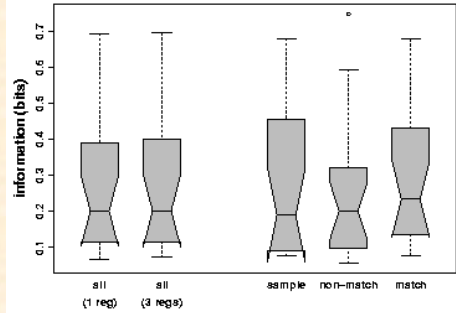
## Changes in noise



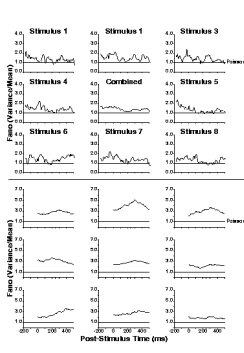
## Basic response statistics unchanged



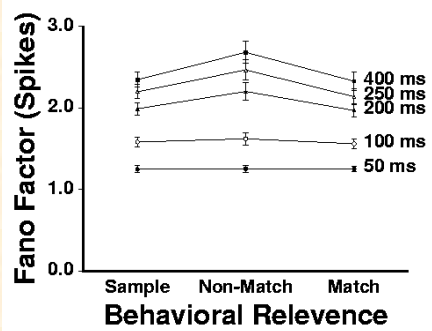
## Information about stimulus



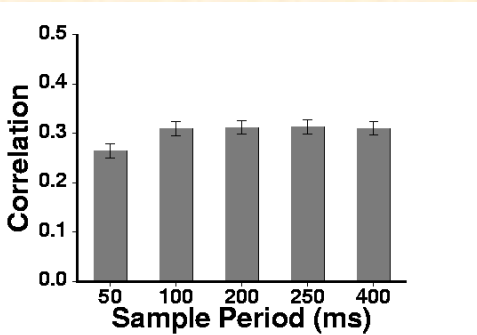
## Variability is not Poisson



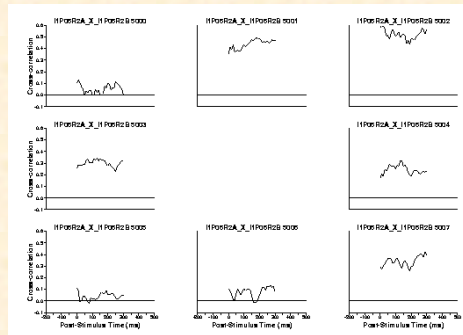
## Summary of non-Poisson variability



## Correlation within responses



## Correlation between responses



## Spike count matched model

SCM Model

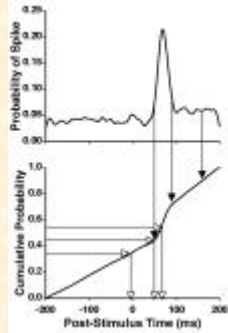
Calculate the SDF

Generate the cumulative SDF

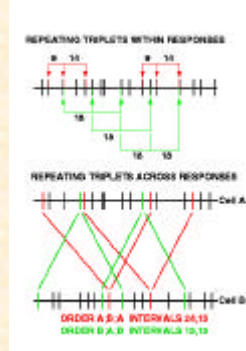
Take each observed spike count (e.g. 3)

Simulate a spike train using random numbers (0-1)

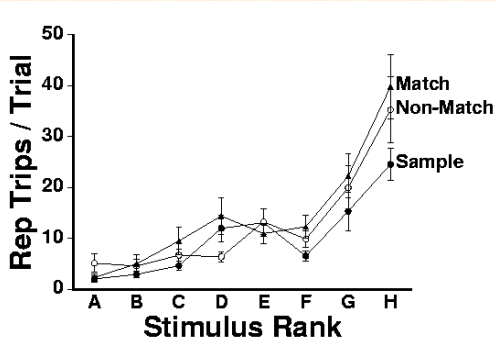
Adjust to match ISI



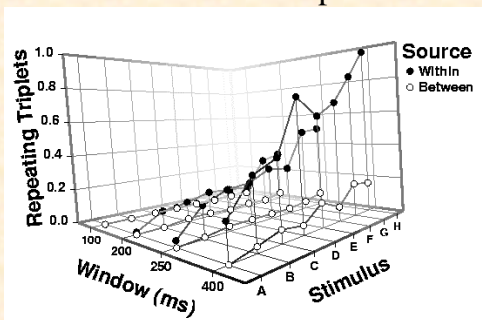
## Repeating triplets



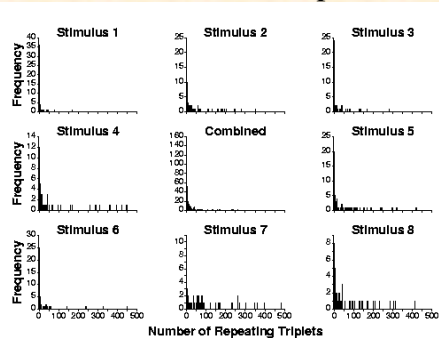
## The number of triplets



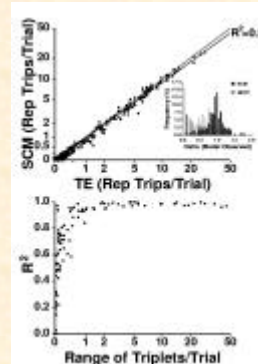
## Source of the triplets



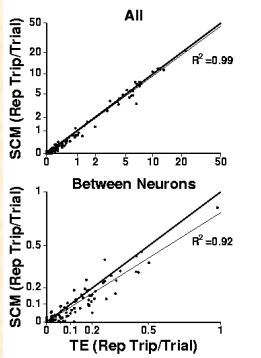
## Distribution of triplets



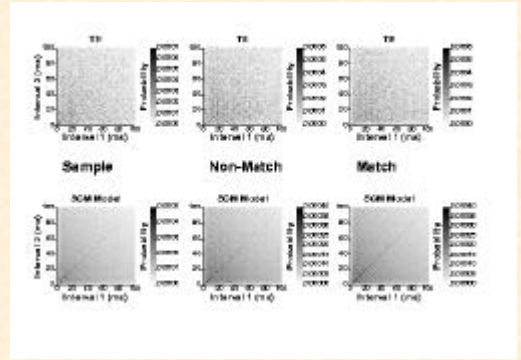
## Predicting the triplets



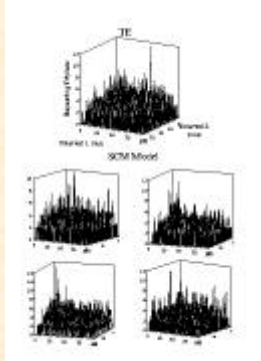
## Predicting the triplets



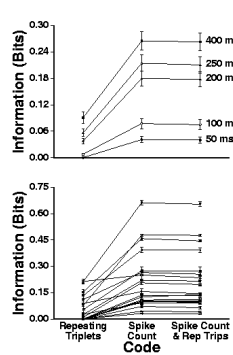
## Types of triplets



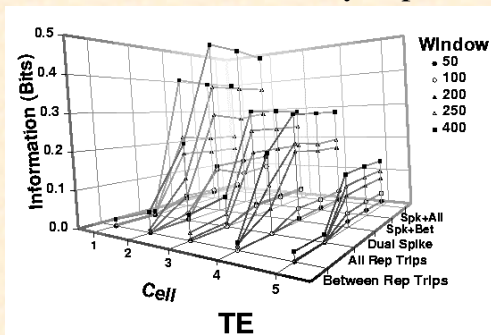
## TE, Triplets & Sore thumbs



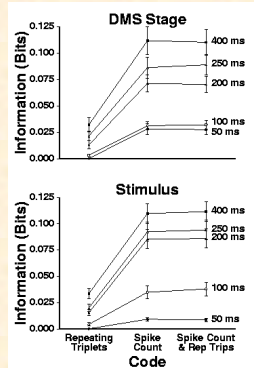
## Overall information redundancy



## Information carried by triplets



## Information about stimulus and stage



## Summary

- Coarse measures
  - Increased signal
  - No change in basic coarse temporal response statistics (mean ~ variance unchanged)
  - Increased detectability (stimulus information)
- Number of precisely timed spike patterns
  - Varies with DMS stage & stimulus
    - Stage & stimulus interact
  - Predictable by chance
    - Must include all coarse measures
  - Carry no unique information