



Conclusion

CNS*2003 Workshop

*Unifying Neural Coding, Computation and
Dynamics*

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Benefits for theoreticians

- General:

- Handling heterogeneity
- Predicting computable functions
- Grounding abstract models
- 'Neural compiler'

- Specific:

- Solving negative weights problem
- Generalizing attractor networks



Benefits for experimentalists

- Flexible physiological plausibility
- Generating experiments
- Limiting hypothesis space
- Straightforward application
- Generating predictions
 - vestibular system model: distributions of receptors; tuning curves distribution
 - working memory model: some increase in neural activity; two categories of error



Benefits: A theory

■ Unifies

- Population and temporal coding
- Representation and computation
- Levels of analysis (i.e., top-down and bottom-up evidence)

■ Generalizes

- Types of representation
- Linear and nonlinear computation
- Linear and nonlinear control theory
- Over encoding nonlinearities



Some extensions not discussed

- Predictive coding (Kalman filter)
- Statistical inference (disambiguation)
- Parameter estimation
- Analysis of weight matrices



Conclusion

- Can we construct a general framework for understanding neural function?
- Progress: A 'zeroth' order guess
- Future work:
 - Learning complex circuits
 - Nonlinear decoding
 - Ion channel dynamics (bursting, etc.)
 - Modulating dynamics of PSCs
 - Scalability (64 node Beowulf cluster)



Acknowledgements

- John Conklin, Dwight Kuo, Brandon Westover, David van Essen, Larry Snyder, Brian Fischer, Donald Grierson, Joel Burdick, Richard Mason
- Mather's Foundation
- McDonnell Center for Higher Brain Function
- Canadian Foundation for Innovation
- Ontario Innovation Trust
- National Science and Engineering Research Council
- McDonnell Project in Philosophy and the Neurosciences