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### **Experimental Network Dynamics: Symmetries and Synchronization Patterns**

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There are many challenges for experimental scientists to explore in the field of network dynamics, not the least of which is to find suitable platforms for quantitative observations to test new ideas and concepts in this rapidly evolving field. Three central challenges are (a) How does one gather data efficiently and precisely from the networks small and large to investigate aspects that do not merely confirm predictions from numerical simulations? (b) Can we design experimental systems with their heterogeneities and noise sources well enough to test predictions from idealized models and yet reveal unanticipated surprises? (c) How do we interweave theory, numerical simulations and experiments so that they complement each other and lead us to deeper understanding of the basic principles of network dynamics and motivate us to develop new applications? We describe how experimenters and theoreticians can interact to advance our understanding of the effects of symmetries on network dynamics. Experiments which probe the existence and stability of synchronization patterns that reveal themselves in experiments and connect concepts from group theory, stability analysis and test the numerical modeling of deterministic and stochastic systems will be used to illustrate these ideas.