Sociology 410
Winter 2009

## Study Guide for First Quiz

The first quiz will be on February 4. The quiz will be brief (not more than 15-20 minutes) and will consist of short-answer questions (true-false, multiple-choice, and/or questions that can be answered in a few sentences). The main purpose is to be sure that you are familiar with the basic concepts and arguments presented in the Barabasi text. Below is a list of concepts and themes that you need make sure that you understand, along with a corresponding page number in the Barabasi text. Many of these ideas are found repeatedly throughout the text, but I have tried to indicate the page(s) where they are first introduced or discussed in greatest detail.

- Compare *reductionism* as a scientific strategy versus complexity and the network perspective. (6)
- What was distinctive about Euler's *method* of solving the Konigsberg Bridge puzzle? (11)
- What is the theory of *random networks*? How it conceptualizes *complexity* and what kinds properties do random networks have? (13-19)
- In graph theory, what is meant by *degree* and the *degree distribution*? Compare the degree distribution of *random* graphs (the *Poisson* distribution) with *scale-free* graphs. (22, 67-70)
- Describe *Milgram's* postcard study and its basic findings. (27-30)
- What distinguishes *small-world networks*? Give some examples of small-world networks. How do they challenge the theory of random graphs? (31-35)
- Explain the significance that Granovetter attaches to *weak ties*? (41-44)
- What is *clustering* and how did Wattz and Strogatz propose to measure clustering? (46-47)
- Describe the *Kevin Bacon game* and what network property does it illustrate? (58-66)
- How does one conceptualize *molecular interaction* as a network and what are its properties? (63, 188)
- What is Pareto's *80/20 rule*? How does a *power law* distribution compare with a *normal* (bell curve) distribution? (67)
- Compare *airline* routes with *highways* as different network structures. (71)
- How does Barabasi use *network growth* and *preferential attachment* to explain the power law or scale-free degree distribution? (83-87)
- How does Barabasi explain the possibility of network *latecomers* to become *hubs* despite preferential attachment? (95-96)
- Explain why scale-free networks are both *robust* in the event of random failure but also *vulnerable* to non-random attacks. (111-121)
- What special role do network hubs have in the spread of *disease* or *innovation*? (123-128) What implications do they have for *strategies* to contain diseases or promote innovation? (139-140)
- What first led Baran to propose a communication network analogous to the *Internet*? (145)
- What role does Barabasi see *preferential attachment* playing in the evolution of the Internet? (152-153)
- Explain how the *directed* nature of web links limits the effectiveness of *search engines* and breaks the web into different continents. (163-168) Give some other *examples* of directed networks. (165)

- What does Barabasi mean by *post-genomic* biology? How were the effects of genes understood before and after the recognition of the genetic importance of networks? (180-183)
- How can networks explain why humans have only slightly more genes than simple species like the *C. elegans* worm? (196-97)
- How does *Vernon Jordan* illustrate Barabasi's conception of how and why director interlock networks tend to become scale free? (202-206)
- How does Barabasi explain the phenomenal success of the *Love Bug* virus (132-134) and *Hotmail*? (213-215)
- What does it mean to describe networks as *self-organizing*? (221)
- How does Barabasi characterize the *Al Qaeda* network? What are the implications of this network structure for combating terrorism? (222-223)