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Beijing CSSS 2007 Summary and Closing Thoughts

3 August 2007

David Feldman

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(15 lectures)

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Week II

- Lee Altenberg: Overview of Evolutionary Computation, Spectral Analysis of Evolutionary Dynamics, Higher Order Evolutionary Phenomena.
- Emily Burkhead: Introduction to Discrete Dynamical Systems, Symbolic Dynamics, A Symbolics Dynamics View of Cellular Automata.
- Dan Hruschka: Models of Cultural Diversity, Simple Models of Social Learning.
- 4. **Hao Bai-Lin:** Coarse-graining, Symbolic Description, and Complexity; Factorizable language: Examples from Biology.
- Van Savage: Scaling and Power Laws with a Case Study in Biological Allometry, Biological Scaling Theory and Effects on Populations, Scaling Tumor Growth and Sleep Times.
- 6. Weixia (Bonnie) Huang: Introduction to Network Workbench.

(11 lectures)

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Week III

Week I

3. Henry Wright: Foragers and the Emergence of Agriculture, Villages and the

4. Jon Wilkins: Coalescence, Evolutionary Landscapes, Genomic Imprinting,

 Dave Feldman: Tools and Foundations in Complex Systems: Chaos, Information Theory, Computation Theory, Measures of Complexity.

2. John Pepper: Agent-Based Models, Evolutionary Theory.

and Approximate Bayesian Computation.

Emergence of Tribal Alliance Systems, Raising Civilizations.

- James Glazier: Developmental Biology, Computational Modeling, and CompuCell3D.
- 2. Han Jing: The Collective Behavior of Multi-Agent Systems, I and II.
- 3. Han Zhangang: Agent Based Model of the Division of Labor.
- 4. **Jia Qing-Shan (Samuel)** Ordinal Optimization: Soft Optimization for Hard Problems.
- 5. Raissa D'souza: Understanding Networks: Theory and Application. I–III.

(12 lectures)

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Week IV

- 1. **Chen Xiaosong:** Introduction to the Institute of Theoretical Physics of the Chinese Academy of Sciences.
- 2. Jin Xiaoyi: Introduction to Population Dynamics in China.
- 3. Marc Feldman: Rural-urban Migration in China Social Networks, Human History Seen through the Genes.
- 4. Eric Smith: Origins of Life.
- 5. Chris Wood: Imaging Brain Structure and Function: Prospects and Progress, Research at the Santa Fe Institute.

(8 lectures)

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Some Descriptive Statistics

- 1. 46 lectures
- 2. This corresponds to 2.4 days
- 3. Approximately 1100 slides, all of which Li Li and the ITP staff helped to photocopy.
- 4. Let us assume that the entropy per word of written English is around 1 bit per symbol.
- 5. Then, assuming 25 words per slide, and 4.5 symbols per word, the lectures have transmitted at least 100,000 bits or 100 kb.
- 6. You are now joining a select group of over **2000 CSSS alumni**.

Also ...

- 1. Student Workshops.
- 2. Group Agent-Based Model Experiment.
- 3. Presentation on tips for giving research presentations.
- 4. A Mandarin lesson for the foreigners, and an English clinic for many of the Chinese.
- 5. Many announcements from Dave, Will, and other staff.
- 6. Scavenger hunt to the Summer Palace.
- 7. Many trips to the forbidden city, the Great Wall, etc.
- 8. Many meals in Beijing restaurants.
- 9. Numerous dancing lessons and expeditions.

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Goals of the CSSS

- 1. Complex Systems Content: Provide a foundation in some of the central tools and themes in the study of complex systems and introduce students to some current areas of application and advanced topics.
- 2. Interdisciplinary, Collaborative Research: Give students hands-on experience and develop skills for working in in collaborative groups that span disciplines.
- 3. International Collaboration: Give students experience and develop skills for working in international research collaborations.

Whether or not we've met these goals is ultimately up to you to decide.

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Thoughts on Models

- I believe it is extremely valuable to try and answer a question different ways.
- Too often math classes teach us to solve problems that have already been posed.
- This is the case for any class whose title is a method.
- As many others have said, be careful about the assumptions hidden in models.
- When we use models, they use us back.

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Some Other Thoughts and Advice, Big and Small

- Keep in touch with CSSS colleagues after the school ends.
- If you have some good photos of the CSSS, please share them on the wiki or elsewhere.
- Most people I know who are excellent researchers:
 - Know more than they have to know
 - Are good at both math/theory and computation.
- Review literature thoroughly. Use the science citation index and google scholar. Interdisciplinarity is no excuse for sloppiness.
- Interdisciplinary is good, but it's a means, not an end.

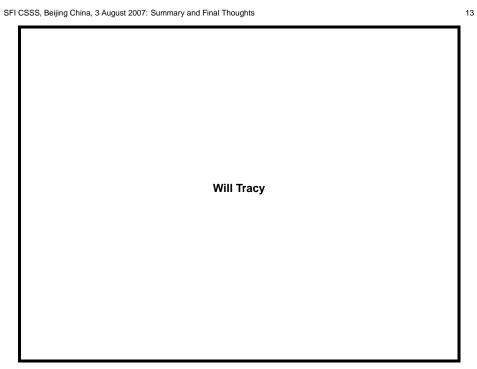
Thoughts on Projects

- In terms of the goals of the CSSS, the process of doing the projects is at least as important as the product.
- Collaboration can be hard, and interdisciplinary and international work can present additional challenges.
- Over the next few days, I'd encourage you to reflect on the process of doing your projects.
 - What worked well in your collaboration and what didn't?
 - What role(s) did you play in your group?
 - What could you have done differently?
 - What did you enjoy the most? The least?

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Questions

- Try not to lose your passion for big questions
 - If you pursue a career in academia, you will be pressured to pursue traditional, safe problems.
 - You will also be pressured to chose a discipline.
 - It is wise to give in to this pressure, but try to do so in a way that lets you keep working on risky, interdisciplinary, BIG problems.
- The hard part of scholarship is posing big, beautiful questions.
- The role of theory is often to pose questions, not to answer them.
- I hope you leave the CSSS with more and better questions than you started with.
- There are (few) set paths for interdisciplinary work.
- Caminante, no hay camino. Se hace camino al andar. (Searcher, there is no road. We make the road by walking.) -Antonio Machado.



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