DRAFT

Spring 2012

PUBP 880 – 001
GLOBAL AND INTERNATIONAL PUBLIC POLICY

Instructor: Dr. Hilton Root
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Office: 636 Founders Building
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Time: Monday, 7:20 pm – 10:00 pm (Jan 23 - May 16)
Location: Founders Building Rm. 312
Office Hours: Monday 5:15 pm - 7:15 pm
Tuesday 3:00 pm- 4:15 pm

This course is based on the premise that economic and social systems share important properties with other complex systems such as evolution, living cells, the global ecosystem, the human brain, the internet and the weather. It employs scientific theories and innovations to understand complex processes that represent the most challenging policy dilemmas of the twentieth first century. It explores the proposition that the frontiers of modern science can provide social scientists with a common set of thinking tools for observing and abstracting patterns of social behavior and ultimately for adapting policy mechanisms to address the wickedly hard questions of contemporary, global political economy.

COURSE REQUIREMENTS:
Students are expected to keep up with each week's required readings and to participate in class discussion.

Grading is based on one book review, one term paper.
10% class discussion
20%: **One book review** and class presentation of a title in the syllabus that the student will present to the class in a brief 10-minute presentation.
20%: **Midterm** Take Home
50%: **One term paper**

A) Write an essay in which you explore how the study of complexity can be applied to practical problems of global public policy. Demonstrate potential connections between evolutionary theories of complexity and problems in global management, government or organizations. As examples consider problems that economics has inadequately explained such as the rise of China; can models of evolutionary complexity provide more realistic understandings? How can new ideas in biology and physics, such as selection and self-organization help

form better policies? Can they help us to understand how complex organizations evolve? Devise experiments that can reveal laws or patterns that govern the emergence and co-evolution of contemporary institutions, organizations or technologies.

OR:

B) Computationally adept students can construct computer-based simulation models to analyze complex systems. Show how artificial worlds like Sugarscape can be created to capture relevant aspects of the global problems under consideration during the semester. Given all exogenous and endogenous factors, construct model economies that evolve over time so that different scenarios can be analyzed using the models as virtual testbeds for theory generation and exploration.

REQUIRED BOOKS

1. Barabasi, A.L. 2003. *Linked: How Everything is Connected to Everything Else and What It Means.* Plume.
2. Beinhocker, E., 2006, *The Origin of Wealth: Evolution, Complexity, and the Radical Remarking of Economics*, Harvard Business School Press, Boston.
3. Epstein, Joshua M. and Robert Axtell. 1996. *Growing Artificial Societies, Social Science from the Bottom Up*, Brookings Institution Press, Washington, DC.
4. Root, Hilton. L. 2012. *No Captain at the Helm: the Network Structure of Global Political Economy (*Manuscript)

Other materials will be available on e-reserves (password: global) and hourly reserves at the library.

Recommended Background Sources: (Not Required)
For a general overview of complexity:

M. Mitchell Waldrop, 1993, *Complexity: The Emerging Science at the Edge of Chaos*. Simon & Schuster.

Mark Buchanan. 2007. *Social Atom: Why the rich get richer, cheaters get caught, and your neighbor usually looks like you.* Bloomsbury Publishing.

Mandelbrot, Benoit and Richard L. Hudson, 2004, *The (Mis)behavior of Markets: A Fractal View of Risk, Ruin, and Reward*, Basic Books, New York.

Mayer, Ernst. 2001. *What Evolution Is.* Basic Books, A Member of the Peruses Books Group

Scott, Page. 2011. *Diversity and Complexity.* Princeton University Press.

Mitchell, Melanie. 2009. *Complexity: A Guided Tour*. Oxford University Press

Simon, Herbert A. 1996. *The Sciences of the Artificial - 3rd Edition*. 3rd ed. The MIT Press

Week 1: JANUARY 23

Introduction: Complex Adaptive Processes and Global Political Economy
"Indeed "theories" of complex social systems are tested on massive scales everyday, when governments implement various policies that often involve substantial resources and ultimately have tremendous impacts on the lives of countless citizens" (Miller and Page 2007: 235). Although we are far from a unified formulation of complexity this semester we will share with scholars from many disciplines the excitement of applying perspectives from the study of dynamical systems to problems of global and international public policy. We will explore questions like did complexity cause the demise of central planning and will it cause the reconsideration of neo-classical models of economic development as well?

Required Readings:
W. Brian Arthur, "Why do Things Become More Complex?" Scientific American (May 1993) p. 144

Murray Gell-Man, "What is Complexity?" Complexity, Vol. 1, no. 1, 1995. http://www.santafe.edu/sfi/People/mgm/complexity.doc

John H. Holland, "Complex Adaptive Systems, Daedalus, Winter 1992, pp. 17-30 (*Reprinted with permission from John Wiley and Sons, Inc.: *Complexity*, Vol. 1, no. 1, © 1995).

Stephen Jay Gould, "Darwinian Fundamentalism," New York Review of Books, Vol. 44, no.10 (June 12, 1997)-- http://www.nybooks.com/articles/1151 (An attack on Dennett's book, Darwin's Dangerous Idea by an evolutionary theorist)

Week 2: JANUARY 30

Topic: Seeking Legitimacy in the Age of Uncertainty

An overview of some of the basic paradigms of governance, development policy, foreign policy and international relations.

Required reading:
- Huntington, Samuel. P. 1993. "The Clash of Civilizations." *Foreign Affairs* summer.

- Ikenberry, John. G. 2011. "The Future of the Liberal World Order." *Foreign Affairs.* May/June 2011.
- Fukuyama, Francis, *The End of History and the Last Man* 1992 (3-22; 71-81; 109-125 (E-Reserves)
- Seymour Martin Lipset 1959." Some Social Requisites of Democracy: Economic Development and Political Legitimacy," American Political Science Review 53 (1959): 69-105
- Root, Hilton.L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Introduction and Chapter 1

Recommended:

- Dougherty, James E. and Robert L., Jr Pfaltzgraff (2001) "From Realist to Neorealist and Neoclassical Realist Theory," *Contending Theories of International Relations: A Comprehensive Survey*. New York: Longman. (On E-reserve)
- George, Alexander. 1993. *Bridging the Gap: Theory and Practice of Foreign Policy.* Washington D.C. Institute of Peace Press (3-30: Handout) (19-29: 107-115: on E-reserve).
- Kagan, Robert. 2009. *The Return of History and the End of Dreams.* Vintage Books.

Week 3: FEBRUARY 6

Topic: The Evolutionary Path of Institutional Development

Since the nineteenth century economic thought has posited a basic timeless level of reality. Economic systems are viewed as either in equilibrium or veering towards equilibrium, or moving among a sequence of equilibrium. What basic questions has economics left unanswered? How has the tool kit of economics determined the very choice of what may be a pertinent variable and what should be a part of the problem we try to solve? What laws govern how far from-equilibrium systems adjust to changes in the environment?

Required reading:

- Beinhocker, E., 2006, *The Origin of Wealth: Evolution, Complexity, and the Radical Remarking of Economic*. pp. 21 – 43, Harvard Business School Press, Boston.
- Bueno de Mesquita, Bruce, and George W Downs. 2005. "Development and Democracy." *Foreign Affairs* 84:77.
- North, D. C., 1990, 1991, "Institutions," *Journal of Economic Perspectives,* 5(1) Winter: 97-112.
- Arthur, B., Durlauf, S. and Lane, D. (1997). *The Economy as an Evolving Complex System II*. Addison Wesley, Redwood City Ca. Chapter 1 (E-Reserves)
- Root, Hilton.L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Chapter 4.

Recommended reading:
Eggertsson, Thrainn. 2005. Imperfect Institutions. The University of Michigan Press.
Easterly, William. 2002. *Elusive Quest for Growth: Economists' Adventures and Misadventures in the Tropics.* MIT Press. (1-23; 21-44; 71-84; 101-121) (**Electronic book available to GMU students, faculty and staff**)

Week 4: FEBRUARY 13

Topic: Dynamics in Social Systems: Building blocks for a new framework

We will examine what it means for economic analysis that nontrivial outcomes cannot be inferred from knowing a part, even a very large part of a global structure. In complex systems the behavior of interactive agents is qualitatively different from that of any individual agent. How do complex systems emerge? Are they designed, planned or do they emerge spontaneously and if so under what conditions? What are the social pre-conditions of self-organization? What role does self-organization play in economic systems? Do some societies have a greater capacity for self-organization than others? What analogue in economic organizations functions like DNA in living organisms? How do network properties emerge from society's micro-architecture? How do different learning rules produce different outcome? To what extent does robustness depend on the details of institutional construction? The price system, which is defined in terms of deterministic laws is itself a fundamental expression of self-organization – a basic paradox of economics. What are the self-organizing capabilities of decentralized market economies? A vast majority of world's goods are traded according to small set of market rules and within a narrow band of organizational principles. Why do markets exhibit particular observed regularities despite the absence of top-down planning and control?

Various evolutionary theories assume that wealth is created by the interaction of society and technology to decrease entropy in favor of `fit order' that meets social needs, desires, and preferences. What fundamental processes shaping society are irreversible and stochastic, not amenable to deterministic and reversible economic laws? A central discovery of both physical and natural sciences are that small changes in initial conditions may lead to large amplifications in final outcomes. What does this insight mean for the study of economic or social policy? What role does irreversibility play in economic development? Living creatures can preserve the memory of forms and functions acquired in the past throughout long periods of evolution. Are societies any different? The role of irreversibility is growing in all sciences. What about economic systems?

Required reading:

- Miller, John. H. and Scott E. Page. (2007). *Complex Adaptive Systems, An Introduction to Computational Models of Social Life,* Princeton University Press (1-30, 44-54, 141-178, 200-243). (E-Reserves)

- Beinhocker, E., 2006, *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics*. Chapter 8, pp.161 – 186; pp. 187 - 217, Harvard Business School Press, Boston.
- Yaneer Bar-Yam, 1997 *Dynamics of Complex Systems*, Addison Wesley, Reading Mass. (1-15). (available on E-reserves). AND ADDITIONAL, TBD
- Epstein. Joshua. M. 2006. *Generative Social Science: Studies in Agent-Based Computational Modeling*, Princeton University Press, Chapter 1: Agent-Based Computational Models and Generative Social Science: pp. 4 – 46.
- Eve, Raymond A., Sara Horsfall and Mary E. Lee, eds. 1997. *Chaos, Complexity and Sociology: Myths, Models, and Theories*, SAGE Publications. Foreword: Chaos and Social Science pp. xi – xxvii; and Chapter 3: The Persistence of "Emergence": pp. 30 – 38 (available on E-reserves)
- Root, Hilton. L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Chapter 1.

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Recommended reading:

- Bak, Per. 1996. *How Nature Works, the Science of Self-organized Criticality*. Springer-Verlag New York, Inc.
- John H. Holland, *Emergence: from Chaos to Order* 1998: Helix Books.

Week 5: FEBRUARY 20

Topic: Introduction to Agent Based Modeling

"Our everyday experience teaches us that adaptability and plasticity of behavior, two basic features of nonlinear dynamical systems capable of performing transitions in far-from equilibrium conditions rank among the most conspicuous characteristics of human societies. It is therefore natural to expect that dynamical models allowing for evolution and change should be the most adequate ones for social systems" (Nicolis and Prigogme, 1989: 238). Building models and confronting them with observations is the basic work of policy making. The failure of neo-classical economics to predict, explain and understand fundamental changes in the evolution of contemporary societies leads us to seek new analogues and to construct new archetypes which will shape the new policies that reflect the behavior of complex systems.

- Epstein, Joshua M. and Robert L. Axtell. 1996. *Growing Artificial Societies: Social Science from the Bottom Up*. Washington D.C: Brookings Institution Press, Cambridge: MIT Press.
- Scott, Steve and Matt Koehler. 2011 "A Field Guide to Netlogo". *George Mason University Press.* Available to download by request of instructor.

Week 6: FEBRUARY 27

Topic: Fitness landscapes

Required Reading:

- Beinhocker, E., 2006, *The Origin of Wealth: Evolution, Complexity, and the Radical Remarking of Economics,* Harvard Business School Press, Boston pp.187-217
- Frenken, Koen. 2006. *Innovation, Evolution and Complexity Theory*. illustrated edition. Edward Elgar Publishing (available on E-reserves)
- Simon, Herbert A. 1996. *The Sciences of the Artificial - 3rd Edition*. 3rd ed. The MIT Press. (selected chapters available on E-reserves)
- Gribbin, John. 2005. *Deep Simplicity: Bringing Order to Chaos and Complexity*. Random House. (available on E-reserves)
- Root, Hilton. L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Chapter 5.

Recommended Readings:

- Arthur, W.B. 2009. *Increasing returns and Path Dependence in the Economy.* University of Michigan Press.
- --------. 1994. *The Nature of Technology: What It is and How It Evolves.* Free Press.

Week 7: MARCH 5
Topic: Complexity in the Governance and the Evolution of the Modern State

Where does the modern state come from – conflict, culture or economics? How do common characteristics develop at the scale of an entire ethnicity? What is Nationalism? How can Multi-ethnic Polities Survive? Humans first organized themselves as families, clan's tribes and ethnicities. States arose in tension with these earlier groupings. How and why did states arise in very few human settings? Why is it so difficult for states to be formed? How are states generated? Are they self-organizing entities? How much self-ordering is necessary to produce a state? Are some human groupings more prone to creating states than others? Is the propensity to form a state related to the fitness of the individuals comprising it or to some characteristic of group dynamics that we have yet to identify? Are certain organizational tendencies located within certain families, which then play a role in macro-evolutionary processes? Can macro-evolutionary change be segregated from questions of individual fitness?

Required reading:

- Cederman, Lars-Erik. 1997. *Emergent Actors in World Politics: How States and Nations Develop and Dissolve*, Princeton University Press, pp. 3-71, 150-231.
- Philip Bobbitt 2002, *The Shield of Achilles: War Peace, and the Course of History* "The Market State": 213-242
- Lobell, Steven E., Norrin M. Ripsman, and Jeffrey W. Taliaferro. 2009. *Neoclassical Realism, the State, and Foreign Policy*. 1st ed. Cambridge University Press. pp.**194-227.**

- Page, Scott. 2011. *Diversity and Complexity*. Princeton University Press. Pg. 196-248 (E-reserves)
- Root, Hilton. L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Chapter 6 & 7.

Recommended

- Reich, Robert B. 2008. *Supercapitalism: The Transformation of Business, Democracy, and Everyday Life*. Reprint. Vintage

Week 8: MARCH 12 NO CLASS (Spring break)

Week 9: MARCH 19

Topic: Differentiating among Democracies - Political Behavior during Economic Transitions

Why has democracy in the third world not lowered inequality, why has it not made public policy more responsive to the needs of the underprivileged? Why has the spread of political democracy not reduced economic inequality? How do societies find and universalize a self-consistent moral code. Consider the paradox that loafing is most effective when others are industrious and lying makes sense only when others tell the truth.

Required reading:

- Kitschelt, Herbert and Steven I Wilkinson (2007) "Citizen Politician Linkages: an Introduction." *Eds. Patrons, Clients and Policies: Patterns of Democratic Accountability and Political Competition* pp.1-49 New York Cambridge Univ Press
- Carothers, Thomas. 2002. "The End of the Transition Paradigm." *Journal of Democracy* 13:5-21.
- Diamond, Larry Jay. 2002. "Thinking About Hybrid Regimes." *Journal of Democracy* 13:21-35.
- Root, Hilton. L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Chapter 8 & 9.

Week 10: MARCH 26
Topic: Networks

The discovery that complex systems have an underlining architecture governed by shared organizing principals has implications for understanding the dynamics taking place within those systems.

Required Reading:

- Barabasi, Albert-Laszlo. 2003. *Linked: How Everything Is Connected to Everything Else and What It Means*. Basic Books.
- Hausmann, Hidalgo et al. 2012. *The Atlas of Economic Complexity: Mapping Paths to Prosperity*. http://atlas.media.mit.edu/media/atlas/pdf/HarvardMIT_AtlasOfEconomicComplexity.pdf

Recommended:

Watts, Duncan J. 2003. *Six Degrees: The Science of a Connected Age*. New York:Norton
Jackson, Matthew O. 2008. *Social and economic networks*. Princeton University Press

Week 11: APRIL 2

Topic: Development Assistance and Institutional Transplants

Although understanding complex adaptive social systems is a key goal of our work this semester, we would also like to discover tools to influence the outcome of these systems. Much of the value of the research agenda of complexity is motivated by the desire to improve social systems. As Miller and Page (2007) noted, "Indeed, "Theories" of complex adaptive social systems are tested on massive scales every day, when governments implement various policies that often involve substantial resources and ultimately have tremendous impacts on countless citizens" (235).

What critical level of complexity causes development to spring to life? Is the economy like sand or water? The effect of adding several drops of water are proportional to the number of drops. A mean field approximation is sufficient to explain the change that occurs as more drops are added. But in sand there is friction which prevents equilibrium from being reached. Friction causes the sand pile to collapse at some level of criticality a single additional grain of sand will cause an avalanche. What is that level? How do we identify when social entities are at the critical stage? A developed society is constantly reinventing itself using simple rules to create complex products. How can this process be initiated and reproduced?

Required reading:

- Eggertsson, Thrainn. (2005). *Imperfect Institutions: Possibilities and Limits of Reform*, University of Michigan Press, Chapter 11: Minimal Property Rights and Legal Transplants (pp. 174 – 190) and Conclusion: The Subtle Art of Major Institutional Reform (pp. 191 – 202).
- Pritchett, Lant; Woolcock, Michael; Andrews, Matt. 2010 *Capability Traps? The Mechanisms of Persistent Implementation Failure. World Bank*
- Ramalingam, Ben, and Harry Jones, with Toussaint Reba and John Young. 2008. *Exploring the Science of Complexity: Ideas and Implications for Development and Humanitarian Efforts*, ODI Working Paper 285, Feb. 2008.

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.131.9534&rep=rep1&type=pdf

Week 12: APRIL 9

Topic: International Finance as a Complex System
What are the internal dynamics of markets? Are markets self-propelling systems driven in large part by what investors believe that other investors believe? Do market participants trade on rumors and gossip, fears and expectations? Why do traders speak of market optimism and pessimism? How can agent-based models let market behavior emerge from interacting participants? Can instability arrive suddenly, like a phased-transition akin to the way ice melts into liquid water? How can excessive leverage push markets into instability? How does the failure of one investor to cover a position spread throughout the system?

1. Geanakoplos, John and Ana Fostel. "Leverage Cycles and the Anxious Economy," *American Economic Review* (2008), 98(4): 1211-1244
2. Roe, Mark. 1996. "Chaos and Evolution in Law and Economics' *Harvard Law Review* 641.
3. Root, Hilton. 2011. "The Policy Conundrum of Financial Market Complexity". (download at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1754774)

Recommended

4. Darley, Vincent and Alexander V. Outkin. 2007. *A Nasdaq Market Simulation: Insights on a Major Market from the Science of Complex Adaptive Systems.* World Scientific. *(*On Reserve)

Week 13: APRIL 16

Guest Speaker
Week 14: APRIL 23

Topic: Policy Making in a Complex World

During the final week the class will discuss their ideas about the key challenges facing the evolution of the global political economy. Among the topics to be considered are development and economic growth, equality and justice, democracy and governance. After the key questions to be investigated are identified we will discuss methods for pursuing their investigation. We will consider how the complexity approach can be combined with other political economy traditions in comparative politics, international relations and economic development. Students are encouraged to relate the topic of their discussion in this session with their final project**.**
Required reading:

- Beinhocker, Chapter 18: Politics and Policy, pp. 415 – 450
- Simon, Herbert A. 1996. *The Sciences of the Artificial - 3rd Edition*. 3rd ed. The MIT Press pp. 139-169 (E-RESERVES)

- Root, Hilton. L. 2012. *No Captain at the Helm: Network Structure in Global Political Economy*. Chapter 10 and conclusion.

Week 15: APRIL 30
LAST DAY OF CLASS
DISCUSSION OF STUDENT PROJECTS

Week 16: MAY 7
Reading day
FINAL TERM PAPER DUE

General Software, Toolkits, and Hardware

A website reviewing academic work on evolutionary complexity and social science is

http://www.econ.iastate.edu/tesfatsi/

- **Ada for Agent-Based Simulation**

  From Bruce R. Barkstrom (NOAA National Climate Data Center): "Ada, a general purpose programming language originally developed by the U.S. Department of Defence in 1983, appears to provide an appealing tool for developing agent-based software. The language has undergone two major revisions, one in 1995, and a second in 2005. An excellent open-source implementation is available with the GPL license at the **AdaCore Site**, from which it is possible to download both the GNAT GPL version and the GPS Integrated Development Environment, as well as numerous other libraries and toolkits. The reason Ada would appear to be an attractive language for agent-based simulations is that Ada defines a model for concurrent programming as part of the language itself. A task is an active component encapsulating a light-weight process and it provides a simple model for executing multiple code blocks concurrently - and for allowing different tasks to communicate and synchronize. In cases in which it is necessary for concurrent processes to avoid interference, Ada also provides protected entries and tasks. Because Ada has been designed to handle embedded, distributed systems, it also has excellent exception handling capabilities."

- **Brahms: Multi-Agent Discrete-Event Simulation (Java based)**

  From the developers: " **Brahms**, developed by the Brahms Team in the Computational Sciences Division at the NASA Ames Research Center, is a multi-agent discrete-event simulation environment. It is also an Agent-Oriented Language for implementing real-time distributed agents. There is an agent language construct that can inherit from multiple group constructs. This permits

the modeling of teams of agents either interacting in one model or distributed over multiple models. Agents are belief-based (BDI) activity-oriented, and both deliberative and reactive. Besides agents, the Brahms language also includes constructs for objects and object-class inheritance for modeling of data objects and real world artifacts. Agents and objects are located in a conceptual geography model, enabling agent and object movement in this geography. The Brahms byte-code is XML, which is interpreted by the Brahms Virtual Machine. Each Brahms agent executes in a separate Java thread using a subsumption-based activity and rule execution engine. Multiple Brahms Virtual Machines can interact together via a network using a message- and directory-based communication layer. Agents can publish themselves and locate others on a network, using a distributed directory service. Agents interact via a message-based communication layer that can be based on any low-level communication protocol, such as Corba, UDP, TCP/IP, SOAP."
Brahms can be downloaded at **Agent iSolutions**. A **Tutorial on Brahms** is also available.

- **Breve: 3-D Simulation Environment (Open Source)**

  Breve is a free software package that provides a 3-D environment for the simulation of decentralized systems and artificial life. Users define the behaviors of agents in a 3-D world and observe how they interact. Breve includes physical simulation and collision detection for the simulation of realistic creatures, and an OpenGL display engine so that users can visualize their simulated worlds. It is available for Mac OS X, Linux, and Windows platforms.

- **MASON: Multi-Agent Simulator - Latest Release (Java, Open Source)**

  The George Mason University Evolutionary Computation Laboratory and Center for Social Complexity has announced a new release (MASON 12) of the **MASON multiagent simulation toolkit**. MASON contains both a model library and an optional suite of visualization tools in 2D and 3D. MASON is a joint effort between George Mason University's ECLab (Evolutionary Computation Laboratory) and the GMU Center for Social Complexity, and was designed by Sean Luke, Gabriel Catalin Balan, and Liviu Panait, with help from Claudio Cioffi-Revilla, Sean Paus, Daniel Kuebrich, and Keith Sullivan. A SwarmFest04 presentation on MASON can be accessed **here**.

- **Repast Latest Releases (Java,Python,C#; Open Source)**

  Repast (REcursive Porous Agent Simulation Toolkit) is an agent-based simulation toolkit specifically designed for social science applications. Originally developed by researchers at the University of Chicago and the Argonne National Laboratory, Repast is now managed by the non-profit volunteer organization ROAD (Repast Organization for Architecture and Development). Repast is currently released in four versions supporting model development in three different languages: RepastJ

(Java based); RepastPy (based on the Python scripting language); Repast.Net (implemented in C#, but any .Net language can be used); and Repast S (Simphony, Java-based, developer's alpha release 2). Repast runs on virtually all modern computing platforms (e.g., Windows, Mac OS, and Linux). The latest Repast releases, along with detailed technical information regarding the installation and use of RePast, can be found at the **RePast Sourceforge Website**. **NetLogo** is a cross-platform multi-agent programmable modeling environment. NetLogo was authored by Uri Wilensky in 1999 and is under continuous development at the CCL (the people who brought you StarLogoT). NetLogo also powers the HubNet participatory simulation system. NetLogo is free of charge. For a fuller description, please go to: http://ccl.northwestern.edu/netlogo/docs/

Statement on special needs of students

If you are a student with a disability and you need academic accommodations, please see me and contact the Disability Resource Center (DRC) at 993-2474. All academic accommodations must be arranged through the DRC.

Online Student Journal

New Voices in Public Policy: I will consider nominating the very best papers in this course for publication in New Voices in Public Policy. New Voices is a student- and faculty-reviewed journal that shares SPP's finest student work with the rest of the world.

SPP Policy on Plagiarism

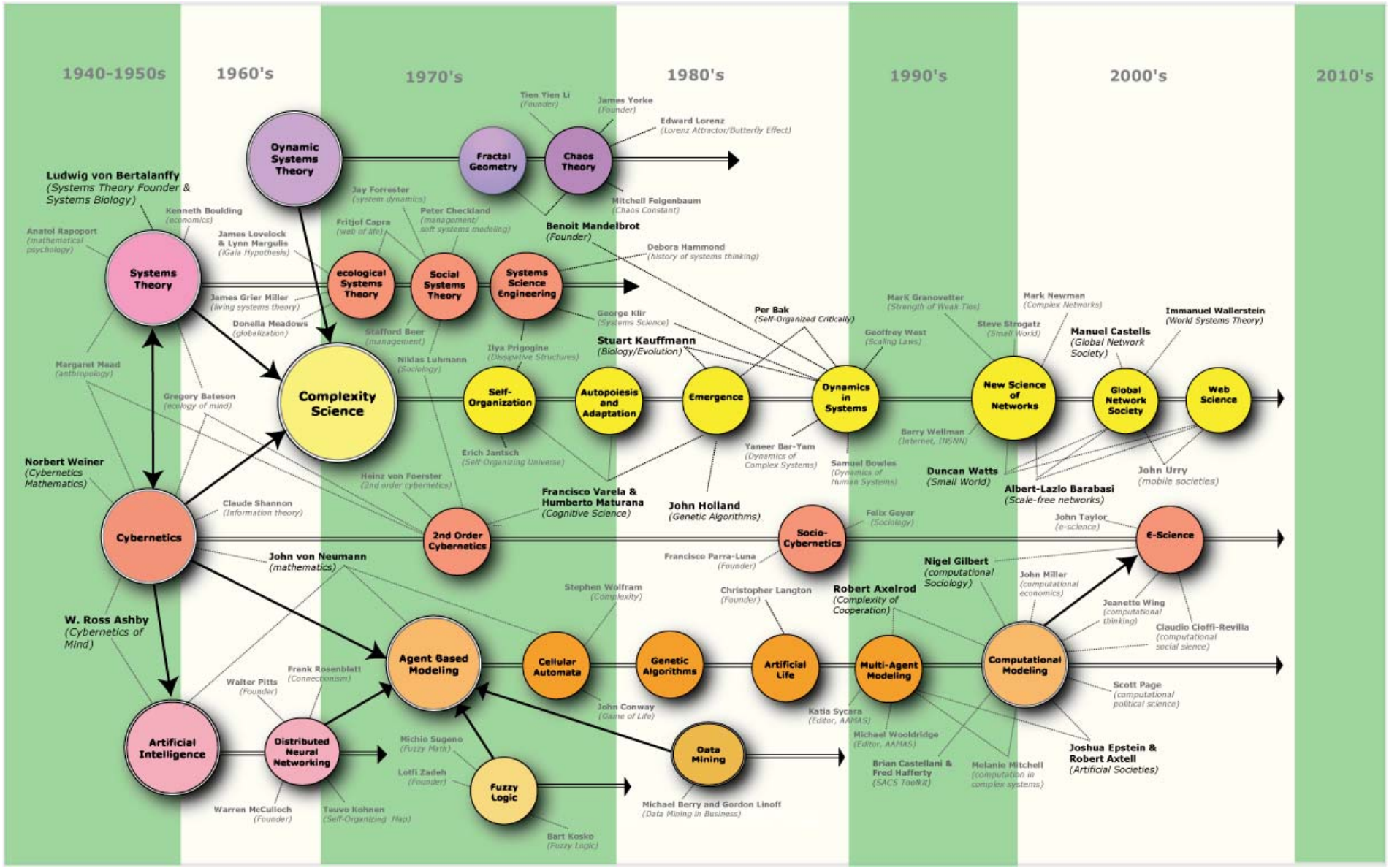
The profession of scholarship and the intellectual life of a university as well as the field of public policy inquiry depend fundamentally on a foundation of trust. Thus any act of plagiarism strikes at the heart of the meaning of the university and the purpose of the School of Public Policy. It constitutes a serious breach of professional ethics and it is unacceptable.

Plagiarism is the use of another's words or ideas presented as one's own. It includes, among other things, the use of specific words, ideas, or frameworks that are the product of another's work. Honesty and thoroughness in citing sources is essential to professional accountability and personal responsibility. Appropriate citation is necessary so that arguments, evidence, and claims can be critically examined.

Plagiarism is wrong because of the injustice it does to the person whose ideas are stolen. But it is also wrong because it constitutes lying to one's professional colleagues. From a prudential perspective, it is shortsighted and self-defeating, and it can ruin a professional career.

The faculty of the School of Public Policy takes plagiarism seriously and has adopted a zero tolerance policy. Any plagiarized assignment will receive an automatic grade of "F." This may lead to failure for the course, resulting in dismissal from the University. This dismissal will be noted on the student's transcript. For foreign students who are on a university-sponsored visa (e.g. F-1, J-1 or J-2), dismissal also results in the revocation of their visa.

To help enforce the SPP policy on plagiarism, all written work submitted in partial fulfillment of course or degree requirements must be available in electronic form so that it can be compared with electronic databases, as well as submitted to commercial services to which the School subscribes. Faculty may at any time submit student's work without prior permission from the student. Individual instructors may require that written work be submitted in electronic as well as printed form. The SPP policy on plagiarism is supplementary to the George Mason University Honor Code; it is not intended to replace it or substitute for it.


1940-1950s
1960's
1970's
1980's
1990's
2000's
2010's
Ludwig von Bertalanffy
(Systems Theory Founder & Systems Biology)
Kenneth Boulding
(economics)
Anatol Rapoport
(mathematical psychology)
James Lovelock & Lynn Margulis
(Gaia Hypothesis)
James Grier Miller
(living systems theory)
Donella Meadows
(globalization)
Margaret Mead
(anthropology)
Gregory Bateson
(ecology of mind)
Norbert Weiner
(Cybernetics Mathematics)
Claude Shannon
(Information theory)
John von Neumann
(mathematics)
W. Ross Ashby
(Cybernetics of Mind)
Walter Pitts
(Founder)
Frank Rosenblatt
(Connectionism)
Warren McCulloch
(Founder)
Teuvo Kohnen
(Self-Organizing Map)
Michio Sugeno
(Fuzzy Math)
Lotfi Zadeh
(Founder)
Bart Kosko
(Fuzzy Logic)
Michael Berry and Gordon Linoff
(Data Mining In Business)
Katia Sycara
(Editor, AAMAS)
Michael Wooldridge
(Editor, AAMAS)
Brian Castellani & Fred Hafferty
(SACS Toolkit)
Melanie Mitchell
(computation in complex systems)
Joshua Epstein & Robert Axtell
(Artificial Societies)
Scott Page
(computational political science)
Claudio Cioffi-Revilla
(computational social science)
Joanette Wing
(computational thinking)
John Miller
(computational economics)
Nigel Gilbert
(computational Sociology)
John Taylor
(e-science)
Felix Geyer
(Sociology)
Francisco Parra-Luna
(Founder)
Christopher Langton
(Founder)
Stephen Wolfram
(Complexity)
John Conway
(Game of Life)
Tien Yien Li
(Founder)
James Yorke
(Founder)
Edward Lorenz
(Lorenz Attractor/Butterfly Effect)
Mitchell Feigenbaum
(Chaos Constant)
Jay Forrester
(system dynamics)
Peter Checkland
(management/ soft systems modeling)
Fritjof Capra
(web of life)
Stafford Beer
(management)
Niklas Luhmann
(Sociology)
Ilya Prigogine
(Dissipative Structures)
Erich Jantsch
(Self-Organizing Universe)
Heinz von Foerster
(2nd order cybernetics)
Francisco Varela & Humberto Maturana
(Cognitive Science)
John Holland
(Genetic Algorithms)
Benoit Mandelbrot
(Founder)
Debora Hammond
(history of systems thinking)
George Klir
(Systems Science)
Stuart Kauffmann
(Biology/Evolution)
Per Bak
(Self-Organized Criticality)
Yaneer Bar-Yam
(Dynamics of Complex Systems)
Samuel Bowles
(Dynamics of Human Systems)
Barry Wellman
(Internet, INSNN)
MarK Granovetter
(Strength of Weak Ties)
Geoffrey West
(Scaling Laws)
Steve Strogatz
(Small World)
Mark Newman
(Complex Networks)
Duncan Watts
(Small World)
Albert-Lazlo Barabasi
(Scale-free networks)
Manuel Castells
(Global Network Society)
Immanuel Wallerstein
(World Systems Theory)
John Urry
(mobile societies)
Robert Axelrod
(Complexity of Cooperation)
Dynamic Systems Theory
Fractal Geometry
Chaos Theory
Systems Theory
ecological Systems Theory
Social Systems Theory
Systems Science Engineering
Complexity Science
Self-Organization
Autopoiesis and Adaptation
Emergence
Dynamics in Systems
New Science of Networks
Global Network Society
Web Science
Cybernetics
2nd Order Cybernetics
Socio-Cybernetics
E-Science
Agent Based Modeling
Cellular Automata
Genetic Algorithms
Artificial Life
Multi-Agent Modeling
Computational Modeling
Artificial Intelligence
Distributed Neural Networking
Fuzzy Logic
Data Mining