

Notes for the presentation at the Workshop
Towards a New Economy – What is Needed.
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Principles for a new approach to economics

1. There are three grounds for rejecting mainstream macro-economic theory
 - a. Irrelevance – it lacks the concepts needed to address the issues of biophysical limits, sustainability, financial instabilities, and inequities in the distribution of income and wealth
 - b. Inappropriate assumptions –the maximizing behaviour of agents, the formulation of the problem as a global optimization, the reliance on comparative statics and general equilibrium, and the focus on a theory of value are too simplistic and inappropriate
 - c. Incoherence – the results do follow from the assumptions
2. Implication

Much of the conventional wisdom based upon mainstream macro-economics must be questioned: the economy as a self regulating system requiring intervention only to correct market imperfections, market prices as objective measures of value, cost/benefit analysis using prices as weights and discount rates for establishing present values as a legitimate means for evaluating social programs and public policy, economic growth and full employment as an equitable means for distributing access to goods and services, GDP as an economic performance indicator, globalization and free trade as a means for increasing efficiency, the separation of economics and political science as separate disciplines.
3. Conclusion (1)

There is a need for a new economic synthesis – one capable of incorporating research in sub-disciplines such as behavioural economics, institutional economics, economic history, ecological economics, biophysical economics, cybernetics, control theory, complexity theory, evolutionary sciences, and political science.
4. Starting point for a new economics is the World View depicted in the diagram
 - a. Earth's systems may be divided into two components: a physical component and a meta-physical component representing the mindspace of humanity as a self-conscious control force. (2)
 - b. The physical component consists of physical transformation processes, both naturally occurring and purposeful in the sense that they are designed and operated to meet human needs subject to physical laws
 - c. The meta-physical component consists of information transformation processes that may be thought of as agents or institutions
 - d. The concept of process is fundamental; it is a dynamic concept concerned with the transformation of input streams of material, energy and

information into output streams within an arbitrary system boundary; the observed states of a system are a manifestation of the dynamic interactions among the underlying processes. (3)

- e. The entire space is open to an inflow of low entropy radiant energy from the sun balanced by an outflow of high entropy energy radiated from the earth into space
 - f. All of the earth system processes produce entropy and are far from thermodynamic equilibrium. Life would not be possible should thermodynamic equilibrium be reached. (4) Higher levels of order or novelty can arise in systems far from equilibrium. (5).
 - g. To meet human needs for nutrition, shelter, etc., humans tap into low entropy energy to perform work that is useful for human purposes in the transformation of natural resources into the artifacts needed to support humanity.
 - h. The mind space orders or controls human activities and the purposeful physical transformation processes. To effectively accomplish this task, the mind-space or controller must have an understanding or systems model of the system to be controlled. This understanding is needed in order to take the actions needed to meet objectives and to monitor the state of the system to assure that objectives are met.
 - i. The understanding or system model is subject to Ashby's law of requisite variety which may be stated as follows: "for effective control, the variety in the systems model of the controller must be equal to or greater than the variety in the controlled system". (6)
5. Consistent with this world view, the economic system is a structure in space-time. Consequently, it is evolutionary, subject to constant and irreversible change.(7) Accordingly, economics should be concerned with the dynamics of the interactions between human activities, both physical and meta physical, and the naturally occurring biophysical processes of the Earth system. The accumulation and propagation of knowledge or know-how is the main driving force in evolutionary change. For these systems, the future is fundamentally uncertain since what know-how we are going to have in the future is in principle not knowable.(8) Erwin Laszlo describes the evolutionary paradigm in the following terms: "The evolutionary paradigm challenges concepts of equilibrium and determinacy in scientific theories; and it modifies the classical deterministic conception of scientific laws. The laws conceptualized in the evolutionary context are not deterministic and prescriptive: they do not uniquely determine the course of evolution. Rather, they state ensembles of possibilities within which evolutionary processes can unfold. (9)
6. From this worldview, some principles for a new approach to economics can be suggested.
- a. The new synthesis of economics thinking will not be based on simple aggregation: the fundamental concept of 'process' is not additive and aggregation always involves information loss. Processes may be identified

at varying degrees of graininess depending on the focus and scope of the analysis.

- b. The new synthesis will be global in scope rather than national given the importance of multinational institutions and the importance of exchange among nations. (10)
- c. In order to handle ecological limits and sustainability, the new economics must incorporate concepts for representing the stocks and flows of materials and energy and the processes that transform resources and energy sources into the goods and services required for human uses. This accounting must be done using energy and mass units and with sufficient compositional detail to recognize that materials and energy carriers differ in their physical and dynamical properties. (11)
- d. Production should be conceptualized as a set of processes that transform natural resources into goods and services using know-how and energy rather than as a theory of value in which labour and capital are sources of value. (12)
- e. The new economics will not use GDP, a one dimensional flow measure of production, as a measure of well-being. A more adequate measure will recognize that well-being depends mainly on the existence of stocks, both public and private, of physical, social and human capital from which services are provided. (13)
- f. The concept of 'debt' is important for the new economics if the phenomenon of financial instabilities is to be addressed. (14) What is needed are the variables contained in balance sheets that indicate the assets, both financial and real, against which debt is issued. A fully articulated set of income and balance sheet accounts subject to the usual accounting identities provides the context for exchange among economic agents.(15)
- g. The new economics will focus on the dynamic interactions among processes and agents and much less, if at all, on general equilibrium and comparative statics.
- h. Choosing among alternative futures and making tradeoffs among interests is a political process. It must be recognized that there is no objective measure of 'best' when parties to decisions hold different values. More emphasis should be placed on learning and communication of understanding rather than prediction and prescription.
- i. The objective is to understand the constraints imposed by biophysical limits and the state of understanding that bound the possible trajectories within the envelope of possible futures. The choice to be made among alternative trajectories is the outcome of a political process and economics should be concerned about informing that process.
- j. The Earth system is a complex system in that it is both compositionally rich and non-linear. Simulation techniques are the most powerful means for understanding and communicating understanding of complex systems. (16) To be effective in this role, simulations must be transparent, they

must capture the essence of the system to be explored, and they must be accessible. (Casti)

7. Economics is much better viewed as a 'management of the commons' problem rather than as a global value maximizing problem. (17) (18)
8. 'Management of the commons' problems have a number of elements;
 - a. An understanding of both the naturally occurring processes that constitute the commons and the purposeful processes for harvesting from the commons must be shared by all participants
 - b. A set of rules governing production from the commons and beneficial use of the products must be agreed upon by all participants. The rule sets will vary depending upon the nature of the commons
 - c. There must be mechanisms for rule enforcement.
 - d. There are interactions among various commons such that mechanisms for coordinating interventions in the various commons are needed.
9. This approach recognizes
 - a. the importance of the role played by knowledge. For example, resources of crude oil were of no value until there was knowledge of the energy potential of the oil, the techniques for refining oil to produce a combustible fuel, and the internal combustion engine for powering vehicles.
 - b. the finiteness of common pool resources
 - c. the need for rule systems or governance systems to ensure that the resource pool is not overexploited and that the benefits from exploiting the resource pool are distributed equitably
 - d. the need for cooperative behaviour if rules are to be effectively and efficiently enforced
 - e. the need for hierarchical institutions of governance

Notes.

- (1) This argument summarized in points (1) to (3) is elaborated in "On the Need for New Economic Foundations: A Critique on Mainstream Macroeconomics" published in CADMUS, Issue 5, Part 2, Volume 1 October 25, 2012.
- (2) This dichotomy is developed by John Schellenhuber in 'Earth System' Analysis and the Second Copernican Revolution. Nature, Vol 402 Supp, 2 December 1999. pp C19-C23.
- (3) This point is made by Fritjof Capra in "Criteria of Systems Thinking", Futures, Volume 17, Issue 5, October, 1985.
- (4) See Kleidon, A. (2010). A basic introduction to the thermodynamics of Earth system far from equilibrium and maximum entropy production. Phil. Trans. R. Soc. B 2010 365, 1303-1315.
- (5) See Prigogine, Ilya and Isabelle Stengers (1984), Order Out of Chaos: Man's New Dialogue with Nature. Toronto: Bantam Books.

- (6) This formulation of the law of requisite variety is attributed to Stafford Beer in I Said, You are Gods. The Third Annual Teilhard Lecture. The Teilhard Centre for the Future of Man, London, 1981.
- (7) Economics as an evolutionary science is not a new idea. It was the subject of an article by Thorstein Veblen published in 1898, "Why is Economics Not an Evolutionary Science?". The Quarterly Journal of Economics Volume 12, 1898.
- (8) The theme of economics as an evolutionary science is developed by Kenneth Boulding in Ecodynamics: A New Theory of Societal Evolution. London : Sage Publications. 1978
- (9) See Laszlo, Ervin. (1987). Evolution, The Grand Synthesis. Boston: Shambhala Publications Inc.
- (10) This point was made by Eric Keirans in his 1983 Massey Lecture. Globalism and the Nation State. Published in The Lost Massey Lectures. Anansi Press.
- (11) 'Activity analysis' associated with Koopmans, Georgescu-Roegan and Leontief, the 'materials energy balance accounting associated with Ayres, and stocks and flows models of Australia (ASFF) and Canada (CanESS) are examples of this approach.
- (12) This conceptualization of production was proposed by Kenneth Boulding in Ecodynamics: A New Theory of Societal Evolution. London : Sage Publications. 1978
- (13) There is much literature on the inappropriateness of GDP or GDPper capita as an indicator of well being or economic performance. See for example Stiglitz, Joseph E., Sen, A., & Fitoussi, J-P. (2011). Mis-Measuring our Lives: Why GDP doesn't add up. The Report by the Commission on the Measurement of economic performance and social progress. New York: The New Press.
- (14) The importance of the concept of debt is established by David Graeber (2011). Debt: The First 5,000 Years. Brooklyn, NY.: Melville House Publishing. See also Keen, Steve. (2011). Debunking Economics (revised and expanded edition): The Naked Emperor Dethroned. New York: Zed Books Ltd.
- (15) The idea of stock flow consistent modeling for financial instability has been advanced by Stephen Kinsella. See for example Kinsella, Stephen. (2011). "Words to the Wise: Stock Flow Consistent Modeling of Financial Instability". Paper presented at the Institute for New Economic Thinking's Bridging silos, breaking silences: New responses to instability and inequality, November 4–6, 2011, Desmond Tutu Center, New York City. Electronic copy available at: <http://ssrn.com/abstract=1955613>.
- (16) This point is made by John Casti in his book entitled Would-Be Worlds: How Simulation is Changing the Frontiers of Science. New York: John Wiley and Sons. 1997
- (17) Garrett Hardin recognized the problem of the management of the commons in his 1968 paper "The Tragedy of the Commons", Science Vol. 162, No. 3859, pp. 1243-1248.
- (18) Elinor Ostrom has studied the management of common-pool resources and has written extensively on this subject. See for example Ostrom, Elinor. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge: Cambridge University Press: Ostrom, Elinor. (2005).

Understanding Institutional Diversity. Princeton NJ: Princeton University Press.
Ostrom, Elinor. (2009). Beyond Markets and States: Polycentric Governance of
Complex Economic Systems. Prize Lecture, December 8, 2009

World View

