"Summary of article by Juan Martinez-Alier with Klaus Schlüpmann: Introduction to *Ecological Economics: Energy, Environment and Society*" in Frontier Issues in Economic Thought, Volume 1: A Survey of Ecological Economics. Island Press: Washington DC, 1995. pp. 21-24.

Social Science Library: Frontier Thinking in Sustainable Development and Human Well-being

"Summary of article by Juan Martinez-Alier with Klaus Schlüpmann: Introduction to *Ecological Economics: Energy, Environment and Society*"

The focus of this volume is the study of energy flow, a unifying principle in ecological analysis, and its application to the economic system. Although the "energetic dogma," which seeks to trace all value to embodied energy, is rejected (following Georgescu-Roegen), the relation between energy flow and economic activity can still provide a fruitful field of study, drawing on an extensive literature dealing with the interaction between human ecological energetics and economics.

This book covers the period between Jevons' The Coal Question[1] (1865) and the 1940s. The object of the volume is to make a contribution to the ecological critique of economic theory "by resurrecting the arguments of half-forgotten authors."(2) The existence of an historical school of ecological economics is often not acknowledged, even by its current advocates; this book may serve to rectify this omission.

Agricultural Energetics

Until recently, most applied work on the economics of energy has been done by non-economists. The results of energy analysis often seem to contradict standard economic theory, for example, in the finding that modern agriculture is less efficient than traditional agriculture (i.e., has lower energy return per unit of energy input). The apparent increase in agricultural productivity is actually a result of the low price of oil used for energy-intensive agriculture. If oil has been undervalued, however, then this productivity increase is fictitious. In addition, standard economic theory heavily discounts the value of resource conservation, using an interest rate based on the assumption of future growth, as Frederick Soddy has emphasized. The critiques of this orthodox theory of exhaustible resources are one of the topics addressed in this volume.

The concept of energy return to energy input was first developed by Sergei Podolinsky[2] (1880-83), who combined an ecological approach with Marxist value theory. His views, however, have not been considered in later Marxist theory. Eduard Sacher[3] (1881, 1889) and Josef Popper-Lynkeus[4] (1912) also studied agricultural energetics and the relation of energy use to economic development, prefiguring modern discussions of a shift to renewable resource use. Around 1840, Liebig, a founder of the discipline of agricultural chemistry, predicted the dependence of European agriculture on non-renewable imported energy sources (guano imports from Peru at that time, and inorganic chemical fertilizers later).[5]

The "Entropy Law" and the Economic Process

Jevons, one of the originators of marginalist economic theory, also brought his knowledge of natural science to bear on the issue of coal use and reserves, though he did not consider intertemporal resource allocation analysis. Walras, whose work is central to modern neoclassical theory, corresponded with Patrick Geddes, who challenged the lack of a physical/energy basis for Walras' theories. Rudolf Clausius[6] (1885) criticized humanity's profligate use of irreplaceable fossil fuel. Many other natural scientists, mathematicians, and engineers were concerned with the efficient use of energy in industry, while physiologists considered energy efficiency in plants, animals, and humans. A physicist, Leopold Pfaundler[7] (1902), analyzed the earth's carrying capacity based on solar energy and photosynthesis. However, the relation of the entropy law to the economic process did not become a well-established field of study.

Social Darwinism and Ecology

Species may adapt to the limited availability of energy in two ways: either by becoming very efficient in their use of available energy, or by devising means to capture more extensive sources of energy. Clearly, the human species has excelled in the second approach. However, extending the ecological principle of interspecific competition for solar energy flux to intraspecific competition among individuals or classes is not a sound approach. Alfred Lotka[8] (1880-1949) and others seem to have leaned in the direction of an energy-based social Darwinism; this line of thought is criticized in this volume.

Ecological and Chrematistic Economics

Soddy, the 1921 Nobel Laureate in Chemistry, is a prominent figure in the history of ecological economics. From 1903 onwards, he urged economists to devote greater effort to the study of energy use. He argued that economists typically mistook real capital for financial capital, and chrematistics (maximization of short-term exchange value) for economics.[9] In Soddy's view, the payment of interest and the maintenance of economic growth depended on the availability of energy and natural resources to fuel real economic activity. Ostwald, a chemist, developed the field of social energetics, arguing that the development of culture depended on an improvement in the efficiency of energy transformation. Max Weber criticized this view, pointing out that in energy terms, hand-weaving of cloth was cheaper than machine-weaving. (The similar issue of energy use in traditional and modern agriculture has already been observed.) However, the cost of machine-weaving depends on the intergenerational valuation of fossil fuels and their externalities. Such a conflict of views pointed the way towards an integration of the social and natural sciences.

"Social Engineering" and the "History of the Future"

Energy and material resources have generally been absent from the discipline of economic history, and the study of ecological history has developed only recently. Faced with the ecological critique, economists have fallen back on a deeply rooted belief in economic growth. However, it is crucial to consider physical limits on potential growth paths. Economics should not merely be human ecology, but economics alone cannot explain either the history or the possible futures of economic systems. In addition, the individualistic economic methodology favored by some - e.g., Hayek - fails to consider the fact that individuals not yet born cannot express their preferences in today's markets.

A fruitful dialogue between socialism and ecological economics should be possible, drawing out the differences of opinion among socialist thinkers on the question of the "boundless" possibilities of technological advance once capitalist relations of production are overcome. Some socialists have rejected this technological optimism in favor of a greater emphasis on

equality and "ecological utopianism." This ideology might be more appropriate for the poor people of the world than either traditional Marxism or the "growth with inequality" offered by market economists.

In summary, the elements of ecological economics have existed for some time, and the field could have been developed long ago. This did not happen due in part to disciplinary divisions.

Notes

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1. W. Stanley Jevons, *The Coal Question* (London: Macmillan, 1865)
2. Serhii Podolinsky, "Le Socialisme et l'unite des forces fisiques," Revue Socialiste, June 1880.
3. Eduard Sacher, *Grundzuge einer Mechanik der Gessellschaft* (Jena: Gustav Fischer, 1881), and *Die Gessellschaftskunde als Naturwissenschaft* (Dresden and Leipzig: Pierson's Velag, 1899).
4. Josef Popper-Lynkeus, *Die allgemeine Nahrpficht als Losung der sozialen Frage* (Dresden: Reissner, 1912).
5. Justus von Liebig, *Letters on Modern Agriculture*, ed. John Blyth (London: Walton and Maberly, 1859).
6. Rudolf Clausis, *Uber die Energievorrathe der Natur und ihre Verwerthung zun Nutzen der Menschheit* (Bonn: Verlag von Max Cohen & Sohn, 1885).
7. L. Pfaundler, "Die Weltwirtschaft im Lichte der Physik," in *Deutsche Revue* 22 (2), April-June 1902.
8. A.J. Lotka, *Theorie analytique des associations biologiques* (Paris, Hermann, 1934).
9. Frederick Soddy, *Cartesian Economics: the Bearing of Physical Science upon State Stewardship* (London: Hendersons, 1922).