



“Summary of article by Philip Mirowski: Energy and Energetics in Economic Theory: A Review Essay” in Frontier Issues in Economic Thought, Volume 1: A Survey of Ecological Economics. Island Press: Washington DC, 1995. pp. 18-21

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

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A striking and little noticed aspect of anti-neoclassical thought in the 20th century is the number of natural scientists who have thought that they were the first to believe that the only "true" economic value is energy. Two groups can be distinguished among the group of scientists under consideration: *the neo-energeticists*, who believe that energy is identical to economic value, and *the neo-simulators*, who regard physics only as a metaphor and as a source of ready-made mathematical models. This article reviews some of the unorthodox economics views of the neo-energeticists, who can be further sub-divided into three categories: 1) those who never ventured beyond a crude theory of energy and value; 2) those who attempt to quantify energy and implement their theory of energy as a value substance; and 3) Nicholas Georgescu-Roegen.

The conviction that there exists a literal identity between the physical concept of energy and the economic concept of value has always had currency in the scientific community. For over a century it has drawn the attention of distinguished scientists and moved from one academic discipline to another. By 1880 the physicist Georg Helm and the physical chemist and Nobel Laureate Wilhelm Ostwald claimed that all of the sciences, including the social sciences, could be united under a small set of principles and concepts. It was believed that energy would form the basis of a unified theory. Others who attempted to advocate the integration of energy theories into the social sciences included the Marxist Sergei Podolinsky, the biologist Patrick Geddes, and the physical chemist Ernest Solvay. Solvay funded the *Institut des Sciences Sociales* to forge a link between the physical and social sciences.

In the 1920s, the research of population biologist Alfred Lotka attempted to lay bare the "biophysical foundations of economics," with energy being the fundamental underlying principle. Frederick Soddy, a physical chemist and Nobel Laureate, was the most consistent advocate of an energy theory of value. Soddy wanted "to obtain a physical conception of wealth that would obey the physical laws of conservation."² He had a crude energy theory of value and showed the existence of monetary divergences from those value principles.

The American engineering profession also contributed towards an energy theory of value. Frederick Taylor, the father of "scientific management," set out to discover the relationship between fatigue and the number of foot pounds of exertion in order to identify the parameters of a "full day's work" in energy terms. In the 1930s, Howard Scott told the New York Times that a group of engineers were working for more than a decade on a survey of the industrial system of the US in terms of energy consumption rather than in dollars, because dollars were a "rubber yardstick." More recently, an energy theory of value has been adopted by some anthropologists, ecologists and sociobiologists. Among anthropologists, Leslie White proposed that all culture should be conceptualized as manifestations of "the amount of energy per capita per year harnessed and put to work."³ Ecologists who have popularized an energy theory of value include Frederick Cottrell and Howard and Elizabeth Odum.

There has therefore been a nearly continuous espousal of the energy theory of value since the 1880s by groups that did not accept the hegemony of neoclassical economic theory. Two conditions that have contributed to the persistence of this theory are the fact that no single group ever developed the theory with any seriousness, and its movement from one fledgling discipline to the next. Recently a new breed of energeticists have started grappling with some of the analytical objections to earlier energy theories of value. The OPEC oil crisis of 1973 provided a boost to this new group. Energy is now treated as an embodied value similar to the classical labor theory of value, and input-output analysis is employed to facilitate calculations of energy values. There have also been further attempts to synthesize biology, physics and economics into a single science.

Neoclassical economics first ignored these theories, but then took notice of the new breed of neo-energeticists by developing a field of economics called "energy economics." They attempt to elevate energy to the status of land and capital in the production function, and to arrive at a price of energy. Neoclassicists such as Ernest Berndt (1978) argue that energy is neither a homogeneous nor a distinct commodity. He takes the neo-energeticists to task for ignoring the Second Law of Thermodynamics: the entropy law. However, the neoclassical solution of putting energy into the production function makes a mockery of physics. Moreover, the neoclassical approach shares many of the weaknesses of neo-energetics, and thus cannot provide a compelling critique of it.

Nicholas Georgescu-Roegen, who ironically is perceived as a neo-energeticist, is the only economist who has provided such a critique. A neoclassical economist in his earlier days, Georgescu-Roegen later turned to a critique of neoclassical mathematical formulations. His book, The Entropy Law and the Economic Process (1971), criticized neoclassical production functions for neglecting the dictates of the laws of thermodynamics. However, while he did disassociate himself from an embodied energy theory of value, a number of his passages sounded like endorsements of this theory. As a result, a number of neo-energeticists have quoted him in support of their theory of value. Georgescu-Roegen responded with explicit critiques of the embodied energy theory of value, making four main points:

- 1) it is wrong to equate matter and energy, and to believe that energy can be transformed into matter;
- 2) the neo-energeticists do not offer a rigorous definition of "net energy";
- 3) they ignore the implications of the Second Law of Thermodynamics by overlooking quality differences in energy; and
- 4) while in theory the neo-energeticists reduce all of their phenomena to energetic essences, in empirical work they derive their embodied energy coefficients from monetary or pecuniary values.

These criticisms can be modified and laid at the doorstep of neoclassical economics, something Georgescu-Roegen has not done in a thorough manner. His promises of the outlines of a new bioeconomics that will lay out the "proper laws" of the economic sphere have not materialized.

Notes

1. An author's note indicates that this article was prompted by two books: J.C. Dragan and M. Demetrescu, Entropy and Bioeconomics (1986), and W. van Gool and J. Bruggink, ed., Time in the Economic and Physical Sciences (1985).
2. Frederick Soddy, Wealth, Virtual Wealth and Debt (Hawthorne: Omni, 1961), 21; cited by Mirowski, 814.
3. Lesley White, "Energy and the Evolution of Culture," in American Anthropologist 45 (1943); cited by Mirowski, 816.