

Book review

ENVIRONMENT, POWER, AND SOCIETY FOR THE TWENTY-FIRST CENTURY: THE HIERARCHY OF ENERGY

Howard T. Odum. Columbia University Press, New York, 2007, ISBN 978-0-231-12886-5, £55.50, 409 pp.

Howard T. Odum deals with big themes in this largely accessible revision of his earlier work of the same title published 30 years ago. Since then much has happened on the world stage, but the core message of this book remains: we all need to understand (and accommodate into our political frameworks) the cycling of energy between biotic and abiotic environments. The Odums, Eugene and Howard, from their respective bases at the Universities of Texas, North Carolina, Georgia and Florida, collaboratively pioneered the study of ecological energetics from the late 1950s until the latter's death in 2007, and in doing so have been recognised by many as the fathers of holistic thinking (Odum, 1971a; Odum, 1971b).

It is a big book at over 400 pages, well referenced (some historical), structured into 13 chapters covering diverse fields, geographical, cultural, biological and physiological, with one central theme: energy. It reads a little like a compendium of a lifetime's achievements, often illustrating a point with reference to the shortcomings of other narrower disciplines. It introduces new terms, 'emtrophy' and 'emergy' to help communicate the residual impact, fluidity and transformative nature of energy flows. There is a lengthy appendix of formulae, and although mathematics is often used to reinforce a proposition, the book is often engagingly written:

'With the turning of the earth the sun comes up on fields, forests, and fjords of the biosphere, and everywhere within the light there is a great breath as tons upon tons of oxygen are released from the living photochemical surfaces of green plants, which are becoming charged with food storages by the onrush of solar photons. Then, when the sun passes in shadows before the night, there is a great exhalation of carbon dioxide that pours out as the oxygen is burned, the net result of the maintenance activity of the living machinery. During the day, while oxygen is generated, a great sheet of new chemical potential energy in the form of organic matter lies newborn about the earth, but in the darkness, the new organic matter and oxygen disappear in hot and cold consumption processes that release heat through the night.' (p. 5)

In this new edition, Odum continues to emphasise the importance of the macroscope – an overarching perspective that manifests on the page in energy flow diagrams. Systems theory has evolved since the 1970s particularly in the fields of computer modelling and simulation. Odum's contribution is in energy system synthesis concerning materials, energy, money and information. The range is dramatic; on page 71 (Table 4.2) is a comparison of power flows between a rainforest and fossil fuel consumption in the USA. On pages 149 (Table 6.1) and 189 (Figure 7.1) the relative magnitudes of primary production and evaluations of intensive corn agriculture are given, respectively. At page 271 (Figure 9.16) a systems diagram of the economy of the USA is presented, and even the human life cycle (page 285, Figure 10.3) is portrayed as functional components of energy transfer.

Odum's macroscopic perspective is not new (e.g. Patrick Geddes and his nineteenth century outlook tower in Edinburgh), but it is underpinned by epic number crunching, giving credence to the view that we probably all share that the world is made up of interconnected systems – a notion often lost as a result of the managerial imperative to compartmentalise. In fact, many may wonder: have we learned nothing since the early edition of this book? Is there evidence of holistic thinking being employed over the past 30 years? We do have sustainable development, a term not mentioned in Odum's book as far as I can see – keen eyes please advise.

Sometimes the style of the diagrams makes understanding difficult, and many of the figures appear to be poor scans. It is difficult to imagine this book being the daily reference of the practitioner, it is more for the policy maker and analyst; however, it is a page turner because even flicking through the pages, whatever one's interest, there is an insight described and to some extent empirically verified. Its real merit is its capacity to stimulate, to cause reflection, and potentially to energise positive actions.

REFERENCES

- Odum EP (1971a) *Fundamentals of Ecology*. WB Saunders Philadelphia, USA (1st Edn. published 1953).
Odum HT (1971b) *Environment Power and Society*. 1st edn. Wiley, New York.

NICHOLAS CORKER