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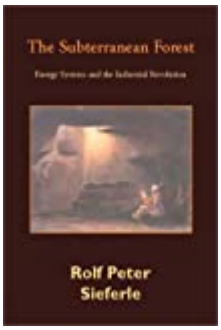

Rolf Peter Sieferle. *The Subterranean Forest: Energy Systems and the Industrial Revolution.* Cambridge: The White Horse Press, 2001. x + 230 pp. Â£35.00 (cloth), ISBN 978-1-874267-47-8.

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Sylva Subterranea is the Latin title of a book by the jurist Johann Philipp Buntingen, published in 1693, on the "usefulness of the underground forest of mineral coal," as the subtitle read. From this work R. P. Sieferle derives the evocative title of his own book, which originally appeared in German in 1982 (*Der unterirdische Wald*, Beck, Munchen) and has now been translated into English by M. P. Osman. As the bibliography reveals, the book has been recently revised through the numerous contributions on the theme published after the German edition.

The central topic of the book is the passage from the mature agrarian system, dominant until the end of the eighteenth century, to the age of growth characterizing the world economy in the last two centuries. This passage is seen as the result of the transition from a solar energy system to an energy system founded upon fossil fuels. While the first one was characterized by an availability of energy that was endless in the long term, but limited in the short by the solar radiation reaching the earth, the main feature of the second is the limited exploitation possibilities in the long run and the almost infinite availability of energy in the short. Modern Growth derives, in Sieferle's view, precisely from the transition from one system to the other, which took place in Europe and primarily in England. The passage from the solar-agrarian energy system to the fossil one is explained by the author as a consequence of the wood crisis striking all of the continent during the eighteenth century. The crisis was prompted, in the background, primarily by the increasing population pressure within the narrow borders of the agricultural mature energy system.

The explanation of the central process of change from an energy system to another and the study of the relationship of the European human society to her natural environment forms the main interest of the book and the most effective reason for its relevance. Nowadays this explanation of the beginning of Modern Growth has gradually reached an increasing weight in historical reconstructions. When the book was first published it was not so and the topic of energy did not yet play the central role it deserves in the debates about the Industrial Revolution and Modern Growth.

The book is a fine and stimulating example of environmental history. It is composed of five chapters. While the first and the last are devoted to methodological aspects and to the evolution of the energy systems in a very wide perspective, the three central chapters deal with the main interest of the author, that is the theme of wood scarcity in Germany and England in the early modern age.

The first chapter is devoted to the topic of energy ex-

ploitation in hunter-gatherer and agricultural societies: the latter characterized by an always increasing pressure of population and the need for a rising and always keener use of solar energy. In the second chapter Sieferle examines the features of the German agricultural energy system and forest exploitation. The pages here devoted to the forest and firewood utilization in preindustrial Germany are among the most interesting of the whole book. Similarities and dissimilarities that exist, under this profile, between Germany and England are examined in the third chapter. In England the reduction of forests under the impact of the increasing population was certainly heavier than elsewhere in the late Middle Ages. A figure based only on hypothetical data (p. 84) and corresponding to what has been known for a long time on the topic reveals the astonishing decrease in per capita amount of wood, as the rising trend of firewood and charcoal prices confirms. The increasing introduction of coal into energy consumption is to be placed in this frame. Some similarities exist between the German and English paths, even if, as stressed in chapter four, in Germany "more land existed that was not well suited for uses other than forestry," and "transport conditions favoured rafting wood and hindered the transportation of coal" (p. 138). In Germany the passage to coal "had the character of a deliberate and enforced act of violence by the state" (p. 139). In general, the path taken by England was followed with delay on the continent. The importance of the transition escaped classical economists–as Sieferle stresses in the last chapter–and was understood, together with the dangers of the new fossil system, only in the second half of the nineteenth century.

Since the impetus from population rise lies in the background of all this process towards fossil fuels, tables (especially for Germany) containing demographic data would have been useful for the non-experienced reader, as well as for the experienced as well. It is not a secondary aspect of the question. After all the movement towards a new energy system was prompted by a wave of increasing population–from the second half of the seventeenth century–seldom, or perhaps never, experienced on a world scale with such intensity. For Europe the theme has been the object of long debates in the last decades. In Germany demographic increase was of the order of 9,000,000, or 60 percent, in the century from 1700 to 1800 alone. To single out the real importance of the demographic problem another aspect, neglected by Sieferle as well as in much more or less recent work on energy, is climatic evolution. How many contributions may the reader, even the expert one, remember on the theme of energy where some lines are devoted to the problem of temperature? Probably none at all. Now, if the solar energy system is based on irradiation and irradiation changes over time, to neglect climatic evolution means to neglect the root of all the system and its influence on the variations of the biomass. The problem is not a secondary one. It is just now receiving increasing attention. The push towards coal derived, in fact, from the increasing population on the one hand and on the decreasing temperature on the other; the problem was particularly felt in the second half of the eighteenth century, when a decrease in average temperature took place all over the Northern hemisphere: it was the last phase of the Little Ice Age. The working of the economic system was menaced by two blades of the scissors, not only by one.

The age of fossil fuel is a transitional phase in the history of the energy systems. Thus, Sieferle stresses several times that "industrialization and economic growth are transitory" (p. 201). Certainly if the Industrial Revolution had started only in the age of fossil fuels, Sieferle would be right. But fossil fuels were not the core of change. They were just an important element in an epochal change towards the invention of mechanical force engendered by non-biological converters, the machines. A much wider use of fossil fuels to heat homes and melt metals would not have engendered the epochal change called today Modern Growth; the substitution for human muscles of machines did it. The age of fossil fuels is a transitory epoch. But can we say the same for the "invention" of the mechanical force from fuels, deriving from the increasing returns of human interaction and rooted in the always progressing trend of the technical usage of environment? To this topic only cursory passages are devoted in the stimulating and intelligent book by Sieferle.

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