Book Reviews

Energy for Man. Windmills to nuclear power. Hans Thirring. Indiana University Press, Bloomington, 1958. 409 pp. Illus. $6.95.

Hans Thirring's book opens with several challenging statements which serve to set the theme for 16 very meaty chapters. We are reminded that our world is now adding to its population at the rate of 70,000 per day, and that this will result in a probable world population in A.D. 2000 of between 3000 and 4000 millions, or of 5000 to 8000 millions in A.D. 2050 (page 216). Food production, we are told, is decreasing rather than increasing. Birth rates are increasing, and two-thirds of the world population suffers from squalor, hunger, and deficiency diseases.

These statements should not pass without comment. As for population, Thirring is perhaps deliberately conservative in his estimates. Despite all the guesswork that enters into long-range projections, many "authorities," including the economic staff of the United Nations, predict a world population in A.D. 2000 of 4000 to 5000 millions and concur in a figure of about 100,000 per day as the present rate of population increase. This, from a broad global viewpoint, is not attributable to an increasing birth rate; the crux of the problem, with its many serious implications, is the decreasing death rate.

As for the world's food production, this is certainly not decreasing, although the per capita supplies in the world's larder are diminishing.

Thirring next points out most cogently that great increases in power production are urgently necessary if we are to solve some of the problems posed by a heavy population burden and diminishing resources of conventional sources of energy. In his inquiries into the energy sources of today and tomorrow, Thirring is very much at home. He gives us in several chapters a number of useful definitions and, by way of reader education, some helpful illustrative calculations. In his discussion of energy sources and reserves, and their utilization, he draws the necessary distinctions between the full heat value of the world's fuels and their electricity equivalent (which is about one-fifth of the full heat value). By way of contrast, it is confusing to read the papers in volume 1 of *Proceedings of the International Conference on Peaceful Uses of Atomic Energy* (Geneva, 1955), in which this distinction is not always apparent. Is it not, for example, a contradiction in terms to list energy requirements and energy values of fuels in "electricity equivalents, computed at full calorific values" when what is really meant, is "full heat value expressed in electrical units"? Including animate energy (a small part of the whole), the world is currently using over 25×10^{12} kilowatt-hours per year (full calorific value) or about 5×10^{12} kilowatt-hours per year (as electricity equivalents). Thirring does not discuss rates of increase in world energy consumption, but it is germane to point out that various authorities have placed this at 2 to 3.5 percent per annum, compounded annually.

It is quite impossible to review this book chapter by chapter, but the headings will give a fair indication of the contents: "Power, energy, and heat"; "Survey of sources and uses of power"; "Steam"; "Internal combustion engines"; "Gas turbines"; "Heat pumps"; "Electricity"; "Coal"; "Petroleum and natural gas"; "Life expectancy of fossil fuel reserves"; "Fuels from vegetation"; "Water-power"; "Solar energy and other sources"; "Atomic energy"; "Nuclear reactors"; and "Thermonuclear reactions."

The need for more efficient use of our diminishing energy reserves is stressed throughout. The reject heat of power stations should be put to proper use: "the reject heat of a moderately large power station of 100,000 kw installed capacity suffices to heat a district of about 10,000 houses." Thirring laments the waste of fuel in operating large motorcars, in which, as is pointed out by Ayres and Scarlett, only 5 percent of the potential energy of the crude petroleum is actually translated to motion of the car. The use of open fireplaces for heating is wasteful in the extreme. In fact "five-sixths of the fuel consumed for residential heating [in Britain] is wasted by allowing 85 percent of the heat to escape through the flues." Because of our diminishing fossil fuel supplies, electrification of railways is urged.

Hydroelectric power is ably considered, but it is pointed out that with the world and its population as they now are, some of the greatest undeveloped sites are just exactly where we don't need them—for example, in Tibet and remote parts of Africa. Unhappily, the transmission of electric power for more than 1000 miles is impracticable.

Solar energy has its possibilities, we are told, but only seasonally (the year around at the equator) and for rather restricted purposes. The author appears to be more sanguine about harnessing photosynthesis than the facts seem to warrant. He discusses hopefully the mass cultivation of *Chlorella* and its use, especially as fuel. He fails to mention, however, the need for vast amounts of carbon dioxide and the serious difficulties imposed by microbiological contamination of the culture and solar heating of the culture medium.

After stressing the inevitable, and possibly early, disappearance of our conventional fuels, the author turns to the great storehouse of power in the atom. Atomic fission is discussed at length, and nuclear reactors are described. The serious problems connected with the disposal of radioactive wastes are emphasized. Finally, the author discusses the elements of low atomic number and considers in great detail the possibilities of harnessing for peaceful purposes the nuclear fusion reactions. Here he tends to be conservative, if not pessimistic, and feels that many, many years will elapse before we shall succeed in building nuclear fusion reactors.

All in all, this is a fascinating book. It is heavy reading but rewarding. The author is clearly at his best in the chapters on engineering, physics, and the atom, and in these he is explicit, precise, and lucid in explanation. The book can be highly recommended to all who are seriously interested in some of the most challenging problems of the world about us.

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The Mammalian Cerebral Cortex. B. Delisle Burns. Arnold, London, England, 1958 (order from Williams & Wilkins, Baltimore). vii + 119 pp. Illus. $5.

Since neurophysiology exhibits a singular propensity for concealing simple concepts behind long names, the author has directed this volume to those for whom the pursuit of neurological problems has escaped the use of the oscilloscope and its complex trappings. He has commendably tried to avoid the terminology which is peculiar to neurophysi-