

performing dubious clinical trials at the Regional Cancer Centre at Thiruvananthapuram, Kerala in 2001. While sadly, as expected, no positive fallout appears to have come of that episode, it appears now that India will soon be a major scene of international action on clinical trials. It would be interesting from the point of view of an Indian physician, to see Western viewpoints on this often grey area – ethical and regulatory aspects of clinical research. One word will suffice to describe the book – outstanding.

The volume consists of extracts and readings on the subject over the years. The book arose out of an attempt to create a comprehensive textbook of classic writings on the topic for a course on ethics of clinical research for the National Institutes of Health, USA. Almost all the articles are from American journals, but the sources are as diverse as *Science*, *New England Journal of Medicine* and *Hastings Center Report*. Even given that Americans usually quote their own sources, I find it difficult to accept that the editors found no useful articles from *The Lancet* or the *British Medical Journal*.

The book begins with a historical section which recalls Tuskegee and many other trials that serve to illustrate man's inhumanity to man. Randomized controlled trials, the ethics of placebo, genetics research, informed consent, human embryo and stem-cell research ethics and more have been covered. I learnt to my surprise from the chapter 'Wanted: single white male for medical research', that most research on human beings had been performed on white men so as to maintain uniformity and reduce variables in subject selection rather than take a general population and 'complicate' the results. [Of course, this could also be used as specious justification to the question 'why are Western researchers now looking towards India for subjects for clinical trials?']. The editors are not afraid to choose controversial topics – for instance, Carl Cohen argues that the belief that use of prisoners as research subjects is unethical on grounds that consent is not free and is due to coercion, does not hold.

There is no mention, as the editors state in the foreword, of the ethics of emergency research or on compensation for research mishaps. Understandably, many of the articles have been edited and all the footnotes and references have been deleted in an attempt to keep the book to a manageable size and price. However, this can be

frustrating for most of us in India. For instance, where will I ever get access to the journal *Social Science and Medicine* for the entire article 'Ethics are local'?

Who should read this book? Certainly, all researchers should; however, I believe that bureaucrats and those in the health industry and the Health Ministry should also study this volume. Even those physicians who practice only clinical medicine, but do not engage in formal research should read it, as the book is a reminder of the many grey areas of medicine and the one underlying principle, *Primum non nocere* (First, do no harm).

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Energy at the Crossroads: Global Perspectives and Uncertainties. Vaclav Smil. The MIT (Massachusetts Institute of Technology) Press, Cambridge, Massachusetts, USA. November 2003. xvi + 427 pages. US \$33.05. ISBN 0262194929.

'The most fundamental attribute of modern society,' writes Vaclav Smil, 'is simply this: ours is a high-energy civilization based largely on combustion of fossil fuels'. It goes without saying that 'energy literacy' and sound energy policies are a must for any society pursuing economic development, industrialization, and higher standards of life. Technical publications on energy, important as they may be, are rarely read by the general public. Vaclav Smil is among a few energy experts who have made a bridge between energy science and the general public. This is his 18th book on energy.

Energy at Crossroads is divided into six lengthy chapters: Long-term trends and achievements (chapter 1); Energy linkages (chapter 2); Against forecasting (chapter 3); Fossil fuel futures (chapter 4); Non-fossil energies (chapter 5); and Possible futures (chapter 6). These titles demonstrate the comprehensiveness of the book on the current situation and future perspectives of energy resources, production, and consumption.

What separates modern countries from traditional and pre-industrial societies is a sharp increase in per capita energy consumption, and this has happened in our lifetime although with varying rates in different countries. Smil chronicles the development of modern energy systems and explains how the 20th century emerged as a century of petroleum and electricity. This trend has continued to the present century. Fossil fuels (coal, oil and natural gas) account for nearly 90 per cent of world's energy consumption. The relative significance of coal, oil and natural gas has changed rapidly. Coal, which dominated the 19th century and early decades of the 20th century, gave way to oil. It is likely that natural gas will play a prominent role in the near future.

Energy means so many things to many people mainly because it is linked to various aspects of our life, work, economy, politics and civilization. Smil explores the linkages between energy and economic development of nations, life standards of individuals, environmental problems facing the world (notably, the impact of fossil fuels on the atmosphere), and war. Smil formulates 'energy intensity', that is the primary energy consumption per dollar of gross domestic product (GDP) in a given country, and shows how it is related to other social indicators such as infant mortality and political freedom index among various nations. Access to energy resources has been a cause of many wars in human history. A remarkable feature of modern wars, however, is that they utilize highly energy-intensive technologies.

Understanding the future of energy, especially oil, is of paramount value to policy makers, industrialists, and business managers, and to the whole humanity. Smil argues against quantitative forecasts of energy futures because the history of such forecasts is mostly a history of failure. There are so many factors and uncertainties that rigid quantitative forecasts are often wrong. Instead, Smil favours normative scenarios, that is, building flexi-

ble, exploratory models to assess the implications of various hypotheses. Computer technology can greatly help us to build such scenarios.

What is perhaps most valuable about Smil's book is that it offers balanced views, rather than take an extremist position. This is especially evident when the author discusses the future of oil. In recent years, there have been numerous publications claiming the end of the oil age and the coming energy crisis. After a close look at the arguments of both optimists (mostly energy economists) and pessimists (mostly petroleum geologists), Smil analyses the pros and cons of each argument, and paints a global picture of a dynamic energy market adjusted to pricing, technical advances, and energy efficiency. This is in contrast to both dramatized pictures of an imminent energy crisis and overconfident notions of infinite, cheap oil.

The author adopts the same balanced, analytical perspective when he discusses non-fossil energy resources such as hydrogen fuel, biomass, and wind, solar, and nuclear power. He explains the potential and limits of each of these resources, and thus provides a framework to appreciate the promises as well as the challenges we face in developing non-fossil energies.

Overall the book attempts to explore this fundamental question: In the 21st century, how can we reconcile the modern world's increasing demand for energy with the necessity to preserve the natural environ-

ment and to avoid poverty and conflict, as well? To answer these issues, Smil suggests 'possibilities' and realistic perspectives for the future rather than make quantitative predictions. He sees the need for reducing our dependency on petroleum not because oil is fast coming to an end, but because of its undesirable impact on the environmental and its links to conflict politics. It is helpful to develop non-petroleum energy systems because some time in the future we have to do it. The transition from petroleum to renewable energy resources is a long road ahead, but one that will eventually occupy us. Smil also sees abundant opportunities for increasing energy efficiency as a near-future option. Energy is neither created nor destroyed; it is simply converted from one form to another. There are many ways of saving in energy conversions, in the larger sector of thermal electricity generation systems (a boiler-turbogenerator has currently 35% efficiency), in a multitude of smaller electricity uses (for instance, replacement of standard city lights with high-efficacy light sources), and in the construction of energy-efficient buildings (for instance, high absorptive dark roofing in sunny climates) and manufacturing of low-gasoline cars.

Vaclav Smil is currently a distinguished professor at the University of Manitoba, Canada. His research on energy analysis spans the past forty years beginning with his first article published in the monthly journal of the Czech Academy of Sciences

in 1966. Therefore, this book comes from the pen of an experienced energy expert. The references cited at the end of the book are nearly 800 sources, of which 32 are credited to Smil. Some of the references can be found on the internet as the author has given their website addresses.

This book, as its title suggests, is a tour of the energy world today and its future prospectives and uncertainties. For those interested in obtaining background information on the science and history of energy systems, I recommend Smil's *Energies: An Illustrated Guide to the Biosphere and Civilization* (also published by the MIT Press, 1999).

This is a well-written, well-researched book by an author with encyclopaedic, interdisciplinary knowledge and insights on energy issues. The book deserves to be read and consulted not only by energy analysts and university instructors but also by educated people who would like to explore the ramifications of energy production and consumption in today's world to their own life and to the world of their children.

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