An epidemiology of the invention virus

The Wealth and Poverty of Nations: Why Some Are So Rich And Some Are So Poor
by David Landes
Little Brown: 1998. 650 pp. $30, £20 (hbk); $15.95, £10.99 (pbk)

Crispin Tickell

Why are some societies rich and others poor? Why do some seem to advance, and others to stagnate or regress? Are there algorithms, or at least broad formulas, to indicate which paths to follow and which to avoid? Is there a measure of determinism or inevitability in human affairs? In 1776 Adam Smith looked at some of these issues in his *Inquiry into the Nature and Causes of the Wealth of Nations*, and now David Landes, emeritus professor of history and economics at Harvard University, has done the same. He thereby joins the honourable company of world historians, from H. G. Wells and Arnold Toynbee to Paul Kennedy and Jared Diamond, who have jumped the barriers of academic discipline, and tried to see human history as a whole.

His vision is both realistic and disturbing. Throughout there is a refreshing lack of political correctness. Some parts of the world are more conducive than others to the welfare of the human organism, shaped as it is, like other organisms, by its environment. Climate, resources and geography may not determine human destiny, but they certainly contribute to it. Nature's inequalities (the title of a particularly interesting chapter) defy human attempts to redress them. We have to start any analysis of the past or look into the future on the basis of what actually is, and this rarely fits current ideologies, whether of the free market, central planning or anti-imperialism.

The past 1,000 years, and more particularly the past 500, have seen a process that led to the predominance of Europe, that oddly shaped peninsular at the western end of Asia. The fundamental cause, to which Landes constantly alludes, is the character of European culture. There was never any European monopoly of bright ideas or technical discoveries. Mayan astronomy, Indian mathematics, Islamic science and Chinese practical inventiveness (from the water clock and gunpowder to the compass, paper and printing) all exceeded European knowledge and technology at the time. The differences arose from the uses to which the Europeans put what they found or took from others.

Exactly why they alone did so is a nice matter for speculation. Among the contributory factors, which varied from place to place and from time to time, must be rich natural resources, diversity of culture within a common culture, dispersal of authority, whether to towns or regions, broad respect for law and private property (at least with regard to other Europeans) and, above all, an individual and entrepreneurial spirit. Together, they made the European ethos distinct from any other.

Landes draws particular attention to the Europeans' use of water wheels as a source of power; the discovery of eye-glasses, which led to spectacles, telescopes and microscopes; the invention of the mechanical clock, enabling time to be measured as never before; the institution of printing presses which led to the first information revolution; and the wide applications of gunpowder which gave the Europeans an unbeatable military advantage and changed the nature of warfare.

Exploitation of these technologies had cascades of political, social, economic and financial consequences. They led to the Renaissance, the expansion of Europe beyond the seas for empire and trade, and the industrial revolution which began in Britain some 250 years ago. The ways in which almost everyone now conducts their lives, whether in wealth or poverty, are a product of these extraordinary events in human history.

The next question is why the virus of invention did not immediately spread elsewhere. Again the answer lies in culture. Some nations were only too willing to learn new ideas and tricks, and to apply them. Journeys of education (or, more precisely, industrial espionage often accompanied by personal inducements) were undertaken widely between the Netherlands, Britain, France, Germany and, later, the United States. Competition between them could not allow otherwise. More often there was strong opposition from established authority, particularly religious bodies. Steel shutters came down to defend society from subversion, as in Spain, later Portugal, Latin America, the Islamic world, Russia and initially Japan. Elsewhere, the virus could not take; the culture was simply too different.

The Chinese had another problem. By the fifteenth century they were drawing in on themselves. For them, any demand for

Have arch, will travel

Arch **by Andy Goldsworthy and David Craig (Thames & Hudson, £12.95) is the story of a journey. The 'traveller' is an arch made from red sandstone, and its journey retraces an ancient route by which shepherds drove their sheep to market from Scotland down into northern England. The route is demarcated by sheepfolds, simple dry-stone enclosures. Many have vanished, to be subsumed by motorways and towns, while others remain. Close to each one, whatever its fate, the arch was erected, stood overnight, and was then dismantled to resume its wanderings to the next fold. Unlike the sheep before it, the arch travelled by truck.**

change implied criticism of the Celestial Empire. Their only dealings were with tributaries. When King George III of England wrote to the emperor in 1793 to propose, among other things, a trading relationship, the emperor thanked him for what he described as his homage, but rejected all his propositions, adding "… we have never valued ingenious articles, nor do we have the slightest need for your country's manufactures".

Viruses can usually penetrate sooner or later, but their effects vary enormously. We are witnesses of those changes today. Over time, winners and losers follow each other. The results can be all the more devastating when they are delayed, as in nineteenth-century Japan and twentieth-century China, or when they are disruptive, as in parts of Africa, Southeast Asia, Latin America and the Middle East today. Next come arguments about so-called developed and developing countries, the reasons for wealth in some places and poverty in others, and demands for technology transfer, as if everyone had rights to the benefits of the consumer society.

Landes has fun with the ideologues, particularly certain economists, and enjoys puncturing illusions of all kinds. He does not attempt to lay down doctrines for the future, but instead focuses on the practical realities. These include, on the one hand, convergence of culture in the process loosely called globalization and, on the other, divergence between rich and poor, educated and uneducated, employed and unemployed. However much we may wish otherwise, nature's inequalities are unchanging, and different varieties of culture will continue to resist the homogenization of human society.

This is a marvellous and stimulating book, written with verve, understanding and scholarship. It deserves to be widely read by those in search of the deeper rhythms of human history. I have one broad criticism. As a kind of afterthought, Landes refers to "the serious, progressive, and possibly irremediable damage we are inflicting on the environment". He also remarks, rightly enough, that "other things equal, it is the rich who poison the Earth". To me, this point is fundamental. If more people are to become rich, can the Earth tolerate more poison? What are the likely effects of human population increase; degradation of land; pollution and shortages of water; loss of biodiversity and the natural services we now enjoy for free; climate change (including sea-level rise); and the combination of all these factors? How will the viruses we have released affect not only the human organism but also the ecosystems of which we are a small but immodest part? Perhaps that could be the theme of Landes' next book. □

Crispin Tickell is at Ablington Old Barn, Ablington, Cirencester GL7 5NU, UK.

From a particular to a global perspective

The Terrestrial Biosphere and Global Change: Implications for Natural and Managed Ecosystems
edited by Brian H. Walker, Will Steffen, Josep Canadell and John S. I. Ingram
Cambridge University Press: 1999. £65, $110 (hbk); £30, $49.95 (pbk)

David Schimel

Describing ecology between the 1950s and 1970s in *The Globalization of Ecological Thought* (Ecology Institute, Luhe, Germany), Hal Mooney wrote that "the environment was assumed, although changing in geological time, to vary around a stable mean … Natural systems were the principal object of study: human-modified ecosystems were more-or-less ignored." He also pointed out that ecology, which began as a global science, became, and to a degree remains, focused on local and small-scale studies. Today's ecologists face problems of global extent resulting from strong anthropogenic trends. Some of the challenges to ecology are intrinsically global, such as understanding the past and future of ecosystems in the carbon cycle. Some problems are becoming global, such as the rapid spread of invasive organisms. Others are local responses to global stresses, of which the leading example is the displacement of the planet's biodiversity by human activities.

Ecologists around the world have responded to the globalization of their science in many ways. The problems involved in studying global ecology are intrinsically different from those of studying, say, the atmosphere. In principle, and to a degree in practice, the atmosphere can be described by basic physical and chemical laws. The essence of ecology, however, is the multi-scaled diversity of the biota: ecosystem types (forests, grasslands, and so on), species diversity within ecosystem types and genetic diversity within species. Few ecological processes can be understood without knowing the particular conditions prevailing at a particular place. Global ecology is built up from a compendium of information about local ecologies and a small but growing number of robust principles that can better knit together local insights into a predictive science.

To achieve a global perspective on a fundamentally heterogeneous world, ecologists, working largely under the auspices of the Global Change and Terrestrial Ecosystems (GCTE) core project of the International Geosphere Biosphere Programme IGBP), have organized themselves into a number of groups designed to bring site-or region-specific knowledge together to produce global perspectives.

The groups' activities include 'networks' of sites and experimenters who make comparable measurements under disparate conditions, modellers coming together to compare results and teams who have combed the literature to assemble global databases. In order to understand the global role of ecosystems, measurements must be available everywhere. This has led GCTE to develop an effective strategy for training scientists from less developed nations into world-class scientists who can provide increasingly sophisticated measurements from all corners of the globe.

The results from the first decade of this approach to global ecology are the subject of this book, which also attempts a synthesis of these activities. What emerges is a series of conclusions, rather than an intellectual synthesis, derived from diverse studies. These conclusions provide some important guidelines for thinking about global changes to ecosystems. The book is also a primer of the state of scientific knowledge on biodiversity and ecosystem function.

The focus of GCTE has clearly been on carbon, water and nitrogen fluxes in the plant–soil system at local to global scales. Reviewing the direct effects of carbon dioxide on ecosystems, the authors conclude that there is clear evidence for a significant effect of carbon dioxide on plant water use, photosynthesis, primary productivity and carbon storage. They also state that the effects of carbon dioxide should become saturated and cannot be expected to continue indefinitely. These preliminary conclusions are based on an assessment of a large number of experimental studies, combined with extrapolation using models.

The bulk of terrestrial ecosystems are now 'human dominated', and the crucial role of land use and disturbance in controlling terrestrial biogeochemistry is a major theme of the book. Emissions from change in land use play a major role in the carbon budget, and emissions of other trace gases (especially the nitrogen gases nitrous and nitric oxide) also increase after disturbance. Opposing this for carbon dioxide, regrowth in forests that were harvested 50 to 100 years ago may contribute to the current sink of carbon dioxide in today's ecosystems. This means that systems that were sources of carbon dioxide in the past now appear as sinks. Land use generates a true sink (in the policy sense) only if the recovering systems eventually store more carbon than the pre-disturbance systems. This could happen because of increasing carbon dioxide, nitrogen deposition or climate change, but the data and models do not yet exist to answer these questions adequately.

The GCTE synthesis makes the crucial point that today's terrestrial carbon is precariously close to balance (1.6 gigatonnes of carbon released to the atmosphere from land-use change with an apparent uptake of 1.9). Modest changes in land use or ecosystem physiology (perhaps from additional