

Book of numbers

Vaclav Smil

How Many People Can the Earth Support? By Joel E. Cohen. Norton: 1995. Pp. 532. \$30, £22.50. UK publication date, 27 March.

THE reader will never get the definitive answer to the question posed by the title of this book. That is, of course, the way it should be. As the author knows well, any attempt to offer and justify such a number is misplaced; the question has no single answer today and it will not have one tomorrow — at least, none from unprejudiced enquiry. Naturally, the catastrophists who long ago decided that the world already has too many people and the techno-fixers who are itching to terraform Mars all have their own answers: no more than about a billion in the first case, an irrelevant astronomical total in the second.

Those of us who prefer reality to dogma know that all sorts of natural, technical and social factors constrain human choices about the planet's carrying capacity, but that our understanding of these limits constantly evolves and changes, and that their acuteness and permanence are vigorously debated, disputed and, in some instances, even denied. If one insists on numbers, then the only sensible way out is to give conditional estimates: that is, given such and such a combination of future choices, available resources, techniques and social arrangements, then it is most likely that the Earth could support so many people. Usually it is only a short time before the many requisite assumptions become either completely indefensible or highly questionable, and one may then begin a new round of scenario-building. These are futile exercises, but the question is here to stay.

One way for a writer to dispose of the question would be to flip it aside by pointing out some of these key realities in a snappy essay. But Joel Cohen chooses instead to smother it. The essay is still there — but the reader must first wade through some 260 pages to reach it. The main reason for the postponed appearance is clear. The author, head of the Laboratory of Populations at Rockefeller University, New York, has done a great deal of interdisciplinary work, but in this book, which offers a perfect opportunity for including the widest range of disciplines and perspectives, he is very much a demographer.

Before attempting to answer the unanswerable, he devotes a lot of space (too much, I think) to a systematic description of past population growth and its long-

term projections. He takes the first topic, which consumes a quarter of the text, from uncertain estimates of total human numbers at the time of the emergence of agriculture to an extended discussion of various growth curves. Forecast reviews, occupying the next quarter of the book, look first at various projection methods and scenarios and then in extensive detail — with summaries of original publications followed by the author's comments — at eight different estimates of human carrying capacity published, by individuals or teams, between 1891 and 1991.

Only then does Cohen start moving beyond the demographic confines by looking at the concept of carrying capacity in ecological terms and by assessing its worth for humans. Again, this is done in a very deliberate way, including an appendix of two dozen verbal definitions of human carrying capacity printed in small type.

None of this is unimportant, most of it is relevant and much of it is interesting. But who is it aimed at? Norton books are

intended to reach a wide readership, but the material here may simply be too much for a lay reader and is mostly too well known to be of value to any serious student of human population. I believe the dilatory stratagem works against the book. Entering *in medias res*, after just a crisp brief recount of the past — which, in this case, is no guide for the future — would have been much better.

Two-thirds into the book, we come to its real core, to what it is all about: human choices. To me the single most important part of the book is a list of 11 simple questions, beginning with "How many at what average level of material well-being?" and "How many with what distribution of material well-being?" and ending with "How many for how long?" and "How many with what values, tastes and fashion?". Reflecting on these questions and trying to answer them in both a personal and a detached way would make any serious reader richly aware of the almost exhilarating indeterminacy of the outcome — and of the immense individual and collective responsibility for the fate of the species.

Unfortunately, Cohen then soldiers on for another hundred pages. Realizing the enormous variety of constraints and opportunities that will shape the human future, he chooses a single case study to illustrate the range of long-term predictions of carrying capacity. He looks at



BETWEEN 1917 and 1920, in the largest internal migration in North America's history, some 450,000 African-Americans left the rural south in search of employment and freedom in the north. The move was commemorated in a series of paintings by the American artist Jacob Lawrence entitled *The Migration of the Negro*. This panel, painted in the 1940s, shows people queuing at a railroad for tickets to the industrial cities of the north. It appears in *The Settling of North America: The Atlas of the Great Migrations into North America from the Ice Age to the Present* edited by Helen Hornbeck Tanner. The text is written by a team of acclaimed historians and illustrated with 100 full-colour maps as well as with photographs, illustrations and detailed timelines. Macmillan Publishing USA, \$39.95.

water as a natural constraint, and he does a good job in discussing its resources and requirements and its links to other growth constraints. He also presents his own calculations of upper limits on world population depending on the availability of water, on the fraction that can be used for irrigation and on prevailing diets. But the outcome is predictable: a huge fan of plausible future population totals.

Afterwards the author discusses, rather gloomily, natural constraints and time. He fears we may fail to come up soon enough with many new fundamental fixes (be they fusion energy or new staple cultivars) for easing or removing some looming constraints. This is perhaps the weakest part of the book, because it largely ignores the enormous opportunities for cumulatively immense changes that humans can produce with existing understanding and skills. Why, for example, worry whether commercial fusion will be a reality by 2040 when rational use of energy in rich countries, which consume three-quarters of all fuels and electricity, could halve the average per capita consumption within a generation, and do so while increasing the quality of life? We can make that choice, but we clearly prefer not to, although we did when world oil prices were rising. Since 1985, however, energy use in rich countries has been increasing again, even in once-so-frugal Japan.

Cohen concludes that the human population is now entering the zone at which many scholars have set its upper limit. Let us suppose they are right, and let us also assume that we will follow all recommendations the author makes in closing the book (population control, mutual aid and so on) and that our numbers will remain below some dreaded unmanageable total (supply your own particulars). Will this really make it easier to do what we cannot do today — run our economies as subsystems of the biosphere and treat our politics as an exercise in altruistic feelings? Seen in this light, moving in 'the zone' does not seem to me any more perilous than before we entered it. Could matters change were we to return to it, or well below it, after a catastrophic population collapse? Nobody knows. The only certainty is that choices will remain. □

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■ **Renewable Energy Strategies for Europe: Foundations and Context** by Michael Grubb has just been published by The Royal Institute of International Affairs and Earthscan at £12.95 (pbk). It examines the political, economic and intellectual driving forces behind a renewable energy policy in Europe; projections, options and current initiatives; and the lessons that can be drawn from history.

Linguistic leaps and bounds

Paul Fletcher

Language and Human Behaviour. By Derek Bickerton. *University of Washington Press/UCL Press: 1995. Pp. 180. \$24.95, £14.95.*

It is not difficult for a linguist to feel sympathy with Derek Bickerton's assertion that modern linguistic scholarship has been neglected in discussions of human evolution. But his aims, in this book-length version of a series of lectures delivered at the University of Washington in 1992, go much further than the mere re-statement of contemporary claims and findings of linguistic theory. One of Bickerton's objectives is to enthrone linguistics in its rightful place as the prince of the behavioural sciences. If language is the means by which our species developed intelligence, rational thought and a distinctive consciousness, rather than a by-product of evolved cognitive complexity, then the specifics of syntactic theory should have broad appeal to students of human evolution. A closer look at some universal principles of grammar should make it clear that "the complexities of language are its own special complexities, arising from sources very different from the desire, conscious or otherwise, to make complex cultures manipulable".

Bickerton is aware that his thesis of the primacy of language in evolution turns contemporary discussion on its head. Language is, he claims, generally held in accounts of human evolution to be a means of communication, much more complex than that of other species, developed to deal with an increasingly complex physical and social environment. Both of these views are dismissed. Communication is just one use for language. And, far from being an invention of an increasingly clever species, language, and specifically the syntactic engine that drives it, was the evolutionary development responsible for the "enhancement of intelligence".

Radical reinterpretations, if they are to have more than the briefest half-life, demand sophistication in argument, passion in exposition and good data. Bickerton shows the first two qualities in abundance. Good data on the evolution of language is, however, hard to find. As Roger Brown observed: "there is no written record of the event of origination, and there are no fossilised phonemes or shards of ancient grammar". To compensate for the deficit, Bickerton makes use of those sources of evidence that are available and which have allowed discussion of the ori-

gins of language to become once more respectable.

Apart from the fossil record, which in terms of evidence about brain size and its implications for language is dismissed in the book, there are two other kinds of information relevant to the argument, language invention and the language abilities of nonhuman primates such as chimpanzees. Language invention — the spontaneous appearance of syntactically organized sequences *de novo* — occurs or has occurred in creoles. These are, when they first appear, novel languages created by children exposed to a variety of languages as well as a pidgin. The similarities in the structures of creoles created at different times and in different places, and the fact that they have syntactic features such as tense markers, as do all established languages, lead Bickerton to the conclusion that the creoles rely on the same biologically given neural substrate that supports children's language acquisition in more usual circumstances.

The second part of the argument is to deny the availability of this substrate to nonhuman primates. However sophisticated their abilities to demonstrate, through the production of items from a taught sign language, that they can learn a vocabulary, these species cannot organize sequences of signs syntactically. If syntax (now seen as the defining characteristic of human language) is not avail-

New in paperback

The Gene Wars: Science, Politics, and the Human Genome by Robert Cook-Deegan. Norton, \$14.95, £10.95. "A scrupulous...narrative of the genesis and opening years of the genome projects.... An essential history", wrote Horace Freeland Judson in a review in *Nature* **371**, 753 (1994).

Flexible Bodies: The Role of Immunity in American Culture from the Days of Polio to the Age of Aids by Emily Martin.

Beacon, \$14. In this contentious blend of anthropology and cultural criticism, Martin attempts to show how immunological ideas of "flexibility" have shaped the way we think not only about our bodies as a whole but also about our economies and societies. Contains many popular representations of the immune system reproduced from magazines, comics, newspapers and books.

Physics and Chance: Philosophical Issues in the Foundations of Statistical Mechanics by Lawrence Sklar.

Cambridge University Press, £13.95, \$19.95. "The book occupies itself with foundations and touches on most of the crucial issues... the only available modern text that has set itself this task", wrote Peter Landsberg in *Nature* **368**, 506 (1994).