At the third stroke, the time will be 2300

The Clock of the Long Now
by Stewart Brand
Weidenfeld & Nicholson: 1999. 190 pp. £12.99

John L. Casti

Daniel Hillis, developer of the Connection Machine parallel computer and founder of The Thinking Machines Corporation, has a new project: a gigantic mechanical clock, perhaps as large as Stonehenge, to be built in the American desert. This fantastic clock is designed to record time for 10,000 years, by ticking (or is it tocking?) once each year, bonging once a century, with the cuckoo coming out on the millennium. The very idea of this clock is to force people's thinking towards long-term awareness and responsibility. As described by Stewart Brand in this provocative volume on long-term responsibilities, "Such a clock … would embody deep time for people".

The Clock of the Long Now is dedicated to the notion that human civilization has locked itself into a dangerously short attention span. Originating with the ever-accelerating pace of technological change, coupled with the quarterly-report mentality of financial markets and the next-election priorities of democracies, some type of redressing of this pathological imbalance is desperately needed. The story told here is an attempt to correct that short-term mentality by teaching us to take the long view — where 'long-term' is measured in decades and centuries.

In a series of 25 short chapters, none of which is longer than about eight pages, Brand takes us on a whirlwind tour of futuristic technology and philosophical enquiry into our relationship to time. All this is focused on how we might re-orientate our view of time to produce a robust and adaptable civilization. To this end, the author proposes six significant levels of pace and size in the way such a society would work. These levels, from fast to slow, are: fashion/art, commerce, infrastructure, governance, culture and nature.

Brand argues that, in a healthy society, each level is allowed to operate at its own pace, protected from below by slower levels and kept invigorated by those faster levels above. So, for instance, if governance changes suddenly instead of gradually, you get the disasters of the French and Russian Revolutions. But if it changes slowly, you have the more benign American Revolution. By the same token, the job of fashion and art is to be quick, engaging and self-absorbed. In short, the fast layers innovate; the slower layers stabilize. And the whole combines learning and creativity with continuity. This is way things *should* work.

A good deal of Brand's book is about The Clock of the Long Now, which, together with its associated 10,000-Year Library, could help us direct our thinking to these various layers of time. In many ways, I found the 10,000-Year Library even more fascinating than Hillis's Clock, perhaps because I write books and don't design computers. Brand gives an exciting account of what such a library might be good for. It would provide, embody even, the long view of things. Such a library would conserve the information that's needed from time to time for a renaissance. It would help make the world safe for rapid change, since it would give assurance that everything that might need to be remembered is being collected and stored. So if we head down a blind alley or get lost, we can always go back to where we started and try again.

The final chapter of Brand's call-to-the-future centres on James Carse's distinction between a finite and an infinite game — and rightly so, since finite games focus on how they end, while infinite games focus on how they continue. And it's continuation we're interested in when we take the long-term view of things. Continuity is king, not revolution. Infinite games are corrupted by inappropriate finite play, for example when governance (infinite) is disabled when factional combat (finite) becomes the whole point, instead of a basis for constructive debate and alternative modes of power. Similar arguments can be applied to situations when one culture tries to eradicate another, or when nature is disrupted by commercial competition. The horrors of Kosovo or the logging of the Amazonian rainforest are specific instances of these general dictums.

In one way or another, everyone has a stake in the future. This well-written, interesting, intelligent book is about as good an operating manual as you'll find on how to ensure that that future doesn't slip away through misadventure, miscalculation, or just plain neglect. □

John L. Casti is at the Santa Fe Institute, 1399 Hyde Park Road, Santa Fe, New Mexico 87501, USA.

Wise old wives

Honey, Mud, Maggots and Other Medical Marvels: The Science Behind Folk Remedies and Old Wives' Tales
by Robert and Michèle Root-Bernstein
Macmillan: 1999. 279 pp. £12.99

Rima D. Apple

Medical science often dismisses the knowledge of indigenous peoples, folklore and homespun knowledge as tangential or irrelevant to the advance of medical practice. Yet Robert and Michèle Root-Bernstein's book provides many examples of how such lay wisdom has informed and continues to shape cutting-edge medical practices.

As old as the stones

Was Stonehenge really dragged into place by teams of sweating labourers some 4,600 years ago? Archaeologist Aubrey Burl tackles this classic mystery and comes up with an easier mode of transport — glaciation — as part of a beautifully illustrated study of legend and history: *Great Stone Circles: Fables, Fictions, Facts* (Yale University Press, $30, £19.95).

Graphic descriptions of these events track the evolutionary development of medical practice, highlighting areas where modern clinical practice is indebted to 'ancient' medicine, 'foreign' (non-Western) health-care techniques or traditional practices handed down within families over the generations.

At the same time, the stories demonstrate how "Western ways of knowing" made it difficult for many physicians to accept these treatments easily.

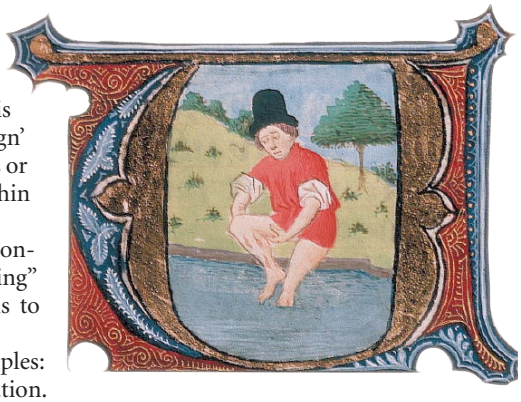
Take one of the most famous examples: Edward Jenner's 'discovery' of vaccination. Smallpox killed many and left survivors with ghastly scars and even blind. 'Variolization' (scratching the skin of a healthy person with pus taken from a patient with a mild case of smallpox) was introduced into Western medicine from the East in the early eighteenth century. It usually resulted in only a mild case of the disease and protected the patient from more virulent strains.

Although less dangerous than contracting smallpox naturally, variolization could kill or scar. English dairy farmers recognized a different and less threatening preventative against smallpox: cowpox, which affects humans only slightly. Rural people insisted that people who had had cowpox could safely nurse smallpox patients.

Physicians rejected this idea as foolishness — most physicians, that is. Jenner infected cowpox survivors with weakened strains of smallpox. During the 1796 outbreak of cowpox, Jenner used pus from the arm of a cowpox patient to inoculate a young boy, James Phipps. A few weeks later he inoculated James with smallpox pus. The boy remained immune. Analytically considered, the practices of farmers and milkmaids changed the face of medical practice.

In examining the curative and preventative treatments that have entered clinical practice from non-traditional sources, the authors, perhaps predictably, call for a sense of humility. As the Root-Bernsteins report, people survived before the advent of antibiotics; maggots were and are used successfully to clean wounds and honey solutions were and are used to pack burns. Many cultures around the globe have engaged in mud- and clay-eating; today, we enjoy the benefits of calcium carbonate and kaopectate.

The practice of blood-letting predates written language; contemporary health care continues to recognize the benefits of phlebotomy in conditions such as haemochromatosis, and leeches have once again joined the medical arsenal. Saliva and urine have been used as therapeutic agents over the ages; patients today are rediscovering the antibacterial benefits of these bodily secretions. The historical development of serendipitous and innovative technological interventions, such as cellophane bandages and 'pneumatic leeches', also receive their due in this entertaining and informative book. Written from the perspective of Western medical thought, these stories of unusual therapies are often followed by a contemporary medical explanation of the mechanisms underlying the treatment.



Suck it and see: leech therapy from Aldebrando da Firenze's *Medical Treatise*, 1356.

The authors illustrate the evolutionary aspects of medical practice by drawing on connections between therapies observed among other mammals and those practised by humans, such as the licking of wounds and the ingestion of urine. They also investigate the role of culture and economics in the acceptance or rejection of medical therapeutics, recognizing that "the best treatment is not simply the most efficacious one, but the one that is actually put to use".

Their conclusion delineates the very real economic barriers to further incorporation of folk medicine into our current health-care system. In most countries today, medical therapies must be approved by a regulatory body before they can be marketed or distributed. For example, in the United States it costs millions of dollars to fund the clinical trials demanded by the approval process of the Food and Drug Administration, not to mention millions for product development, manufacture, advertising and the like.

Such an enterprise would be commercially unfeasible for an inexpensive, readily available product such as honey that cannot be patented. Moreover, despite their generally positive portrayal of non-traditional therapies, towards the end of the book, the Root-Bernsteins issue a warning against cavalierly embracing all such modalities, and provide numerous examples of health-care fraud based on anecdotal evidence from folk medicine. But this short chapter offers little concrete advice on how non-medical people can make meaningful choices.

Still, this entertaining book is replete with fascinating tales examining the untraditional, at times irrational, practices that have been adopted by contemporary medical practice. □

Rima D. Apple is at the School of Human Ecology, University of Wisconsin-Madison, Madison, Wisconsin 53706, USA.

How far the stars?

Measuring the Universe: The Historical Quest to Quantify Space
by Kitty Ferguson
Headline: 1999. 306 pp. £14.99

Virginia Trimble

From Earth and Moon to Sun and stars and on to galaxies and the Universe, our view of the world has grown more or less monotonically throughout recorded history (at least Western history). It is this expanding horizon that Kitty Ferguson has set out to map. Her chosen method is to focus on specific measurements that yielded numbers we now regard as accurate, from Eratosthenes and the diameter of the Earth to current attempts to pin down the cosmic expansion rate (Hubble parameter), the density of the Universe and the infamous cosmological constant. Ferguson tries to give the reader a feeling for what it must have been like to attempt these measurements for the first time.

I came to the book thinking the task worth doing and worth doing well, and so was prepared either to admire elegant explanations of difficult concepts or to carp unmercifully at errors, omissions and misconceptions. Sadly, the negative points greatly outweigh the positive ones. My list of 'bravos' has half-a-dozen items, including an appealing preface on triangulating windmills, a good epilogue, a thought-provoking quote from Fred Hoyle on the impossibility of knowing in advance which problems are solvable by current methods, and an excellent approach to acronyms: she uses very few.

On the other side of the balance sheet: my list of 'truly wrong' has 40 items; 'misleading' = 48; 'something vital left out' = 45; 'poorly explained, perhaps because not understood' = 52; and other miscellaneous oddities, including sudden switches of topic in the middle of a story = 29.

How much do these things matter? Some hardly at all, unless you are personally concerned or need to tell others about the topic. Consider the following (and only) description of the discovery of quasars: "Sandage was involved in some of the first investigations of these objects in the early 1960s, along with Thomas Matthews and Maarten Schmidt." This is, I believe, unique in the literature in the extent to which it understates the contribution of Schmidt, the actual discoverer, although, as a corrective to common overstatements, it also fails in not crediting the radio astronomers, without whose accurate coordinates nothing would have happened.

Somewhat more serious are omissions that leave a very incomplete picture. For instance, neutrinos of non-zero rest mass are the only potential form of dark matter pre-

CORBIS / GIANNI DAGLI ORTI