will be able to advance our broader ecological understanding.

This type of project is also exactly what is needed to enable ecologists to help politicians manage the biological diversity of the Earth when faced with a growing population, and the resulting increase in demand for resources. All such demands must ultimately be met from our natural resources. Research-funding agencies, and hence politicians, must realize that it is not enough to have had one Kluane project. We need many, so that we can compare the dynamics of ecosystems under different settings. Before the Kluane Project we had no role model — now we have one. ■

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A power that's clean and bright

Clean Electricity from Photovoltaics
edited by Mary D. Archer & Robert Hill
Imperial College Press: 2001. 868 pp. £82, $120

Richard Corkish

This comprehensive summary of photovoltaics (solar cells) comes amid growing concern over global warming and energy security. The Sun reliably delivers each year more than 10,000 times the global consumption of commercial energy. All the world's primary energy requirements could be met by solar cells taking up an area less than 0.25% of that presently under crops and pasture.

Much of this book, the first volume in a series on the photoconversion of solar energy, is concerned with detailed descriptions of the various technologies by which solar cells are made. Most of the important ones have a chapter devoted to them, written by experts in the field. The terrestrial market is currently dominated by cells made from wafers of crystalline silicon. This situation has been expected to change for decades but, so far, silicon remains top of the heap, partly because of its ability to piggy-back on developments in the electronics industry.

There are at least two divergent paths for the development of other cell types. The first is to make them more cheaply at the expense of efficiency. Amorphous silicon, cadmium telluride, copper indium gallium diselenide and thin-film polycrystalline silicon are all in production now or soon will be. Another technology, dye-sensitized cells, is not mentioned here but will be included in the third volume in the series. Organic photovoltaics are probably the ultimate low-cost approach, and their progress is detailed here.

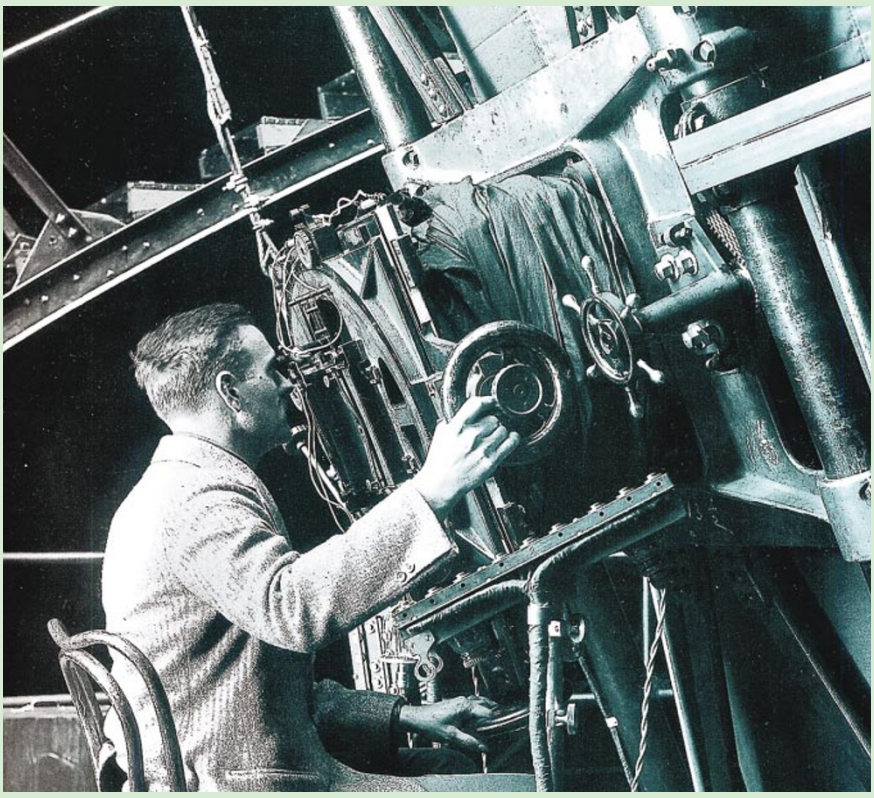
The second path is the pursuit of very high efficiencies, accepting higher costs and using the cells in situations where the extra efficiency pays for itself in space and in concentrators. The most advanced of these are actually stacks of subcells, each made from a different material and each accessing a different part of the solar spectrum. The photovoltaics research community has quite a few other concepts for potentially obtaining greater efficiency, and one of these, the quantum-well solar cell, is fully described here. There are also several recent proposals, still in the very early stages of research, aimed at combining the best aspects of the low-cost and high-efficiency paths, but they are not included here. Each of the above cell technologies is covered in great depth, with the exception of polycrystalline silicon, which, I think, deserved its own chapter.

The rest of the book is concerned with how we can, do and should use solar cells. There is one chapter on space applications, but the remainder are concerned with powering human needs on Earth. Energy storage and system aspects are well documented in separate chapters, and the final three outline the photovoltaic business situation, economics, policy proposals and future prospects, with attention given to applications in both developing and developed countries.

My favourite chapter is close to the start of the book and describes the physics and the mathematical models used to describe the operation of solar cells. It is clear and well arranged and is a pleasure to read. It is followed by another chapter detailing the practical aspects of designing solar cells.

I thought two additional issues deserved a place in this book. First, it would have been good to discuss the wrong but oft-repeated slight against solar cells that they do not recover over their lifetimes the energy used to make them. Second, a more esoteric, but still interesting, topic is the theoretical limit to photovoltaic efficiency. Thermodynamics limits photovoltaic efficiency to about 87% but the best achieved so far is 33%. The book includes an interesting chapter on thermo-photovoltaics, although this is not really a solar-energy technology. However, I am pleased to see it included because the fields are so closely related.

Clean Electricity from Photovoltaics is an excellent resource for its intended readership of students, scientists and technologists working in the area. It seems particularly useful for specialists in one area of photo-



A changing view of the Universe

Improvements in telescopes have been mirrored by advances in our understanding of the Universe. ***Beyond Earth: Mapping the Universe*** **(National Geographic, $40) is a collection of essays edited by David DeVorkin that looks back at some 5,000 years of cosmology — including the remarkable discovery by Edwin Hubble (shown above, seated at the Hooker telescope at the Mount Wilson Observatory in California) that the Universe is expanding.**

voltaics research to gain an overview of closely related ones. Importantly, it is well indexed, and includes a handy list of useful web and library references. At the very least, the book deserves a place in the library of every research institution and company working on renewable energy. I expect to be referring to my copy frequently. But it is not really a book for the general reader, who might be better off with a less technical and more introductory approach, such as that taken by Kenneth Zweibel's *Harnessing Solar Power* (Plenum, 1990). ■

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Last words of a medical historian

Madness: A Brief History
by Roy Porter
Oxford University Press: 2002. 192 pp. £11.99, $22

Andrew Scull

The sudden and unexpected death of Roy Porter in March robbed the English-speaking world of one of its most prolific, colourful and talented social historians and historians of medicine. In the course of little more than a quarter of a century, Porter produced a staggering amount of scholarship in a dizzying array of fields.

From the 1980s onwards, following his move from the University of Cambridge, UK, to what was then called the Wellcome Institute for the History of Medicine in London, he devoted a considerable portion of his apparently limitless energy to the history of medicine and the history of psychiatry. Early on he published primarily on topics relating to the period in which he was most at home, the eighteenth century, including a ground-breaking reinterpretation of madness in Enlightenment England (*Mind-forg'd Manacles*, Athlone, 1987). But in the last decade of his life he ranged far more broadly, producing, for example, a history of medicine from the Stone Age to the present that encompassed not just the dominant Western tradition, but also Arabic, Chinese and Indian medicine (*The Greatest Benefit to Mankind*, HarperCollins, 1997).

Madness is probably the last book Porter wrote — I say probably, for he wrote almost as fast as most scholars read, and it is possible that there is another book still in production. This slim little volume displays several of his virtues as a historian: his wide reading, his prodigious memory, his extraordinary capacity for synthesis, his eye for an anecdote, and the sheer fun he took in telling a story and constructing a narrative. Porter was in many ways a populist, eager to reach a wide audience, and capable of attracting many readers with a witty, graceful and accessible prose style, albeit one that at times was over-addicted to alliteration, puns and wordplay. But he was also capable of serious original research, and was not afraid to advance new and thought-provoking reinterpretations of his subjects.

Readers will find little of that serious side in *Madness*. This is in large part a reflection of his goal in writing the book: to summarize, in a very brief compass indeed, what the historian can say about "who has been identified as mad? What has been thought to cause their condition? And, what action has been taken to cure or secure them?" Such an abbreviated list of questions obviously leaves many vital and fascinating issues wholly unaddressed: the place of madness in high and popular culture; the impact of mental illness on both families and the larger community; non-Western ideas about, and responses to, the insane; and the social functions of madness and psychiatry.

Even so, Porter's chosen remit is an enormous one, and it has to be said that he has been only partially successful, even on his own terms. 'Western' all too often turns out to mean the English experience writ large. He does make sporadic gestures towards an international and comparative focus. There are, for example, a few pages on the physician Philippe Pinel and the French Revolution, and the founder of modern neurology, Jean-Martin Charcot, and his hysterical circus; a stab at characterizing nineteenth-century German academic psychiatry and its reductionist insistence (based on little more than faith) that madness was brain disease; a nod at America's twentieth-century embrace of a bastardized Freudianism. But again and again, both the text and the handful of illustrations return to the ground Porter found most familiar: what the English have thought and done about the crazed from the Middle Ages to the present.

Roy Porter had a sense of fun and an accessible writing style that attracted a wide audience.

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For the specialist, then, *Madness* will not be a book to savour, and for the general reader it represents only a very partial brief history, in more than one sense of the term. The book is, for the most part, a good read, and is easily digested in a single sitting. Perhaps its most useful contribution, however, may be to whet the appetite for more substantial fare, and here Porter's extended and thoughtful list of suggestions for further reading may prove to be this book's best feature. ■

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