

## Science Matters

### A Book For Curious Minds

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*Science Matters*  
Robert M Hazen and James Trefil  
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Let me say at the outset that the book is both readable and worth reading. The authors, Robert Hazen and James Trefil, have set out to remove the 'scientific illiteracy' which they believe exists in the American society. They make special efforts to explain scientific aspects of issues such as acid rain, depletion of ozone layer, (non) construction of accelerators like the superconducting supercollider (SSC) or projects like the Hubble telescope, which have become subjects of debates the world over, due to their economic/social/environmental/ecological impacts. In the American context, where the electorate and lobbies can actually influence political decisions on such issues in a major way, such an exercise to educate the layman indeed serves a very useful purpose. However, this does not mean that the book is not useful in India. A measure of success of this book is the interest with which my 70 year old mother read it and discussed it with me!

The book tries to say something about everything, and that too, in popular language. Clearly, one expects scientific accuracy but not rigour in such an exercise. The authors cover aspects of both physical and biological

sciences that affect our every day life. Along with physics and chemistry, their discussion of physical sciences includes geology and atmospheric sciences, which makes the book different from others written in a similar vein. The authors have managed to present to the reader the purpose of scientific endeavour as well as its methodology quite clearly. Their explanations are quite lucid. Discussion of each topic starts by summarising the basic points very succinctly, and ends by pointing out the current frontiers of research in these areas. This style of presenting information proves quite effective. The examples chosen are from every day life; for example, the use of a roller coaster to explain the concept of energy transformations from kinetic to potential energy and vice-versa. The authors emphasise the implications of various scientific principles/laws on every day life, which makes their point that *Science Matters* matter to all of us.

The authors begin by discussing classical sciences such as the mechanics of moving bodies, electricity and magnetism, and thermodynamics. They use the discussion of laws of motion to illustrate scientific methodology, and the universal nature of laws of science. Then they go on to discuss different states of matter, their transformation into one another, material properties and the relation of all these to, and their explanation in terms of, electrons and atoms. I particularly like the way they explain difficult ideas of the quantum world such as the wave-particle duality and the essentially probabilistic nature of this world at small distance scales. They follow this up by very simple discussions of subjects such as semi conductors, superconductors, lasers, etc., which have

become part and parcel of modern day life. The subjects of nuclear and particle physics, which deal with the ultimate constituents of matter, and forces which act at that level, as well as astronomy and cosmology, which address the universal age-old questions about the Universe around us, have always caught the fancy of the layman and are a must for any popular discussion of science; not in the least because of the very fundamental questions that these topics address. But here too, I liked the way the authors have concentrated on the effects of nuclear physics on everyday life. Of course, the very nature of the other three subjects mentioned above, makes it impossible to do the same for them. But I feel that the authors have succeeded in bringing out the need for studying these issues. I particularly like the way they compare the cost of a state-of-the-art ground-based telescope with that of a major highway interchange to show that basic research does not always cost the earth. However, I feel it would have been useful to mention the technological fall out of the exacting demands made by experimental particle physics and astronomy on technology. The authors end the discussion of these somewhat esoteric subjects by demonstrating convincingly that there is nothing very difficult about relativity—at least, about the special theory.

However, at this point, I must remark that I noticed certain inaccuracies in the discussion of some issues in particle physics, astronomy, cosmos, and relativity. Minor examples are statements such as ‘hundreds of different hadrons are whizzing around inside the nucleus’ or that ‘whatever the dark matter is, it’s not like anything we’ve made in our laboratories now’. The last sentence in the

discussion of cosmos which says that ‘counting dark matter, we can account for about 30% of this expected mass’ is more than debatable. But the most striking and serious mistake (from the point of view of the audience that this book addresses) is a statement in discussions on the special theory of relativity saying ‘There’s still room for warp drive!’ While technically it is true that the theory of relativity only says that ‘nothing now moving at less than the speed of light can be accelerated to and past that speed’, I really doubt there are practicing physicists who will support the above statement about ‘warp drive’. I should add, though, that these shortcomings are more than compensated for by the clear presentation of a wide variety of complicated concepts and facts.

As I said before, the discussion of geology and earth cycles really makes the book quite unique and the authors bring out very clearly the utility of studying different aspects of physics of the earth all together as one unit. I enjoyed these discussions as I myself qualify for the title of scientifically illiterate as far as these subjects are concerned. The last four chapters deal with the one aspect of scientific knowledge which is fascinating and has enormous implications for many aspects of every day life: the biological sciences. I found the discussions on ecosystems and issues such as the greenhouse effect, acid rain, and of course, AIDS/immune systems very well presented.

In short, I think that the curious but scientifically illiterate mind will really welcome this book.

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