Gallery: P N Shankar

Watching the Universe and *Watching the Weather*

A pair of nice slender books

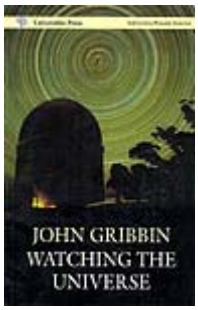
Here are a pair of nice, slender books from the well known popular science writing team of John and Mary Gribbin. Although the titles are similar the books are really quite different in character. This is due at least in part to the fact that the subject matter of the books are so different in nature. Paradoxically we know more about the universe than about the weather.

Let us start with the smaller book, the one on weather. The book, published in 1996, grew out of the regular contributions that the authors made to the 'Weatherwatch' column of the *Guardian*. A consequence is that the book contains no diagrams or figures, a great handicap when one wants to understand the physical processes underlying the motion of winds and currents. Another consequence, which I did not really find irritating, is the heavy dose of anecdotal evidence: folklore and myth regarding the weather. To their credit, the authors try to ascertain whether any of these are supported by scientific evidence. The book is an easy read and could be profitably read by anybody with a little curiosity.

The first chapter gives a nice overview of all the factors, including solar heating and the atmospheric and ocean circulations, that affect the weather. From the second chapter I was surprised to learn that astronomical factors, for example the moon, can affect the weather; this chapter also considers how the weather might be on other planets. The following chapters discuss the effects on evolution of the changing climate, how people (and history!) have been affected by the weather, the problems of weather forecasting, extreme weather events, myths and legends and finally human impact on the weather. Let me give a small sample of the types of interesting facts that the book gives. Had you heard that there is a scientific basis to the idea, suggested by Goesta Wollin, that the changing climate and the changing earth's magnetic field are correlated? Or that Mary Shelley may have written *Frankenstein* because of the bad weather in 1816? Would you have guessed that if all the clouds in the atmosphere were instantly turned to rain, it would make a layer of water only 25mm thick over the entire surface of the globe? Or that hailstones can be as large as cricket balls? The last fact implies that hailstones can be carried up and down a number of times in a cloud by the updrafts and downdrafts before falling to earth. Quite amazing.

Coming to the second book, I enjoyed reading it and learned a few things from it and have no hesitation in recommending it to the general reader, the science student and to any scientist not working in astronomy or astrophysics. The book consists of seventeen reasonably brief essays first published, between the mid-1970's and the mid-1990's, in the *Griffith Observer* and which were, as the author candidly admits, especially tailored to the presumed tastes of an American West Coast audience.

Although this is not formally indicated, the book is divided into three parts that have been rather seamlessly integrated. The first part deals with terrestrial matters: the possible role of a meteorite impact on the vanishing of the dinosaurs and the consequent rise of the mammals and our own species, the conditions necessary for the evolution of life forms in the universe, the dynamics of ice ages on earth and their relevance to global climate change and the role of geological and biological time scales in the development of proper models of the sun. The second with stars and



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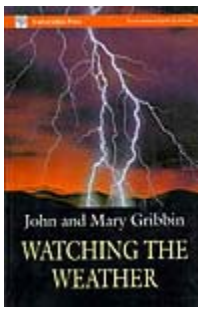

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galaxies: the solar neutrino problem, solar variability, pulsars. black holes and galaxy formation. The last with space, time and cosmology. Naturally, the really trendy topics like white holes, the mass of empty space and inflation appear in this part. I liked the first part the best and the third part the least. This could be because my ignorance of biology and geology are greater than my ignorance of astronomy. It could also be because I am more comfortable with matters that are a little complicated and a little boring but understandable rather than with those that are spectacular but ununderstandable and possibly have little basis in fact. In this context the author's quotation from Mark Twain may be relevant: 'there is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact.'

My own favourite essays are the ones entitled "Waiting for the next ice age" and "The curious case of the shrinking sun." They are special in that they not only describe some remarkable scientific investigations but also beautifully illustrate how science actually works. Sometimes simple effects are not due to a single, simple cause but result from the complicated interaction of a number of causes. Thus in the Milankovich model the ice age rhythms are due to three main astronomical cycles: that of the earth's orbit, that of the tilt of the earth's axis, and that of the precession of the equinoxes. Sometimes the verification and acceptance of such a model, after much controversy, takes many decades of detailed painstaking work in a number of different fields. In this case it required significant improvements in the analysis of ice cores and sediments, in dating techniques and in computer modelling before the model could be declared successful. For example the temperature history of a terrestrial object can be inferred from the proportion of the heavy oxygen isotope, oxygen-18, that it contained at various times. To apply the technique to deep ocean sediments the scientists ingeniously use the oxygen proportions in the shells of small marine creatures found in these sediments! Finally both these essays show how important it is in science to both have faith in the essential correctness of current beliefs and still keep an open mind about the possibility that these beliefs may have to be modified to accommodate new data that has come in. Trying to build an understanding of nature without the former would be akin to building on quicksand; without the latter would be to risk compromising its ultimate integrity. How difficult it is to walk this middle path is shown in Gribbin's fine essay on solar variability. Is the sun really shrinking, can the measurements be believed, does this solve the neutrino problem, how does this affect our weather? - an intriguing story with a good moral.

The book does have some faults. Errors in a popular science book are more serious because the audience is a general one. Typographical ones, such as the missing factor of a half on page 11, are less serious; more so are simplistic statements such as "During the fireball stage of the Big Bang, the sky was ablaze with light throughout the Universe ..". In fact, the tendency to oversimplify matters together with the conversational style adopted to attract the target audience is at times irritating and misleading. This is especially so in the third part of the book dealing with all the hot topics. The problem of how much to simplify is one that has to be faced by all science popularizers. Generally a good policy is to refrain from trying to tell the whole truth while avoiding all that is false. Still, all in all, a good book.

When I was in school in the late 50's, they used to give books as prizes for good scholars, winners of competitions etc. I do not know whether this is still done. If so books such as the ones reviewed here would be ideal prizes. They have the capacity to stir our curiosity, to amaze and enlighten us and are brief and eminently readable. If many dozens of books of this type were available over the whole spectrum of scientific subjects and many students were encouraged to read them we would have far better motivated students than we have at present. And that is finally what counts.

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