from experiences, one's own and of others. Experiences comprise of thoughts and actions. Compilation of the former leads to knowledge and of the latter becomes history. Documentation of the experiences thus facilitates learning.

Documentation unfortunately is not part of the Indian culture. We generally have to read about our history from foreign authors, since few of our compatriots consider it worth their while to document our experiences. In a rare departure, an official history of the DAE came out about 10 years ago. Any new attempt by others in India to document its history should be a welcome addition, as it could provide new insights. The authors of this book have made such an attempt, but have limited themselves mainly to the nuclear power generation part of DAE's activities. Both had served in the DAE, though partaking in work unrelated to power generation. On the strength of their specialization in nuclear physics, they have also held the positions of Visiting Professors in well-known universities in the US and Europe.

Nuclear power is one of those topics that has its ardent supporters as well as vigorous opponents, each disinclined to consider the possibility that there could be after all a basis for the other point of view. This results in glossing over some relevant aspects and does not help in arriving at a proper assessment. This book makes a valiant attempt to strike a balance. But, it attracts our attention only to disappoint.

The main part of this book consists of nine short chapters, with a focus on nuclear power. Twelve appendices are included to provide additional information to the reader. Two of them relate to the nuclear weapons programme, and two more provide a summary of the Atomic Energy Acts of the Government of India. The texts of international agreements entered into by India, including the recent one with the US, form the subject of the last three. The merits and demerits of the agreement with the US and the attendant conditions are described in detail. The authors' conclusion is that the conditions impose no significant constraint and that the agreement would help in increasing the share of nuclear electricity in the country. It remains to be seen as to how quickly and to what extent an increase in nuclear power generation can be achieved, now that the hurdles for international cooperation have been removed.

The authors reveal their unfamiliarity with simple facts of nuclear reactors or nuclear weapons, resulting in misleading statements. They have also been careless with the units for the various parameters listed or their actual values. These matters could easily have been rectified with a bit of effort to verify them for correctness. The authors complain that they were not able to secure access to information direct from the Department's archives. Much of the verification needed could have been achieved even by reference to open sources of good authenticity. There are some hasty judgements as well, apparently arising from a failure to check out their bases. Perhaps, the publisher too must share the blame for some of the blemishes.

A real concern is that much of what the book says is likely to be given undue weightage because of the authors' impressive scientific background and service in the DAE and therefore taken as true, even when it is otherwise.

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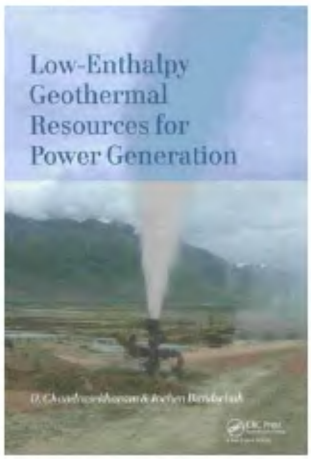

Low-Enthalpy Geothermal Resources For Power Generation. D. Chandrasekharam and Jochen Bundschuh. CRC Press, Balkema, P.O. Box 447, 2300AK Leiden, The Netherlands. 2008. 149 pp. Price not mentioned.

This book is what energy-starved and resource-hunting India needs to distribute among its policy makers, planners and engineers. Not only does this book demonstrate the energy potential of hot-springs world over and in India, but also shows how energy requirements can be successfully supplemented by tapping hot-springs, which have temperature less than 150°C. The forte of the book is the part dealing with modern methodology and techniques of exploring the geothermal resources, and beneficially converting the heat energy of geothermal waters into electricity. This part itself should persuade the planners and executives to opt for this so far little-tried venture.

The book brings out the potentials of low-temperature geothermal resources world over and in India, and suggests ways of overcoming obstacles and difficulties in tapping geothermal energy. It offers solutions for generation of power that would ensure that no greenhouse gases are formed. In other words, tapping the energy of hot-springs on a large-scale implies effective contribution to the lessening of global warming.

While chapters six and seven deal with details of geochemical and geophysical methods of exploration, chapter 8 is devoted to detailed description of electricity from geothermal resources, including resorting to efficient heat-exchangers, mechanisms of submersible pumps, etc. Chapter 9 is about economic implications of power generation by tapping hot-springs. There is a special chapter on the dimension of rural electrification, costs of and marketing for smaller plants, and efforts made in this direction in USA, Tibet, Thailand, Taiwan, Argentina and Iceland.

Preliminary chapters deal with the geological setting of geothermal springs and tectonics of their locations, occurrence in geothermal fields, including two belts in the Himalayan Province, the Konkan coast in west India, and the Tapi–Narmada–Son belt in Central India, and the Sabarmati Graben.

There is a comprehensive atlas of Indian hot-springs and geothermal fields, compiled by Ravi Shankar and published in 1991 by the Geological Survey of India as its special publication (No. 19). The summary of the atlas is available in a number of papers by the same author. There are 340 geothermal areas in five different heat-flow zones that together store heat, which have the potential of generating 10,600 million watts of electricity – equivalent to the energy produced by 5730 million tonnes of coal, or

by 28,230 million barrels of oil. The 46-odd hot-springs alone have temperature high enough (>150°C) to generate electricity amounting to 1838 million watts for a period of 30 years. All that is needed to be done is to directly convey the superheated dry stream to power plants or injecting surface water into fractured rocks through deep wells in geothermal areas, and bring it back in a vapourized form to power plants. And 60-odd springs of intermediate range (150–90°C) have the potential of generating electricity through the use of binary cycle-heat exchangers containing liquid with a low-boiling point which is immersed in underground wells.

Why does India not embark upon this venture, in order to supplement its energy needs, when New Zealand, Iceland and USA, among many nations, are successfully doing this?

Those who are looking for alternative sources of energy and those who care for the environment of the land and sky, would find this book useful.

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The Moon That Wasn't – The Saga of Venus' Spurious Satellite. Helge Kragh (with the assistance of Kurt Moeller Pedersen), Birkhauser Verlag AG, Basel, 2008. 199 pp. Price: US$ 39.95. ISBN 978-3-7643-8908-6.

The renowned Danish historian of science, Helge Kragh is well known for his various books[1,2]. His present book deals with the spurious moon/s of the planet Venus, which were supposedly seen by astronomers like Fancesco Fontana (Italian), Jean Dominique Cassini (Italian), Peder Roedkiaer (Danish) and Frédric Petit (French). This book consists of seven chapters and an extensive bibliography covering literature published during the last 350 years. Also, short biographies of the related astronomers are given. The book also contains more than 30 figures, which provide information of the subject matter, such as the pictures of Venus and its moon/s as seen by different observers.

In the 'Introduction', the reader finds information about the origin of terms 'Venus' and 'Satellite'. The number of discovered satellites (25) until 1910 is also listed (p. 4). In the same chapter, the author justifies his work as follows: 'The case of Venus' supposed satellite is not well known, not even to modern historians of astronomy. Thus, one looks in vain for it in most accounts of the history of planetary astronomy, and it also does not appear in modern works on the history of the Venus transit' (p. 6).

From the chapter 'A moon or not? A century of confusion', the reader learns that Fontana was the first to have observed the moons of Venus in December 1645. The German natural philosopher and engineer Otto von Guericke believed Fontana's observations. In 1672, he published a book and assigned two moons to Venus. Surprisingly, Cassini who observed the moon of Venus in 1672 and 1686, did not mention Fontana's results. Being a reputed astronomer during the 18th century, Cassini's name was attached to the discovery. In 1702 David Gregory, an astronomy professor at Oxford, referred to these observations in the introduction of a book. The Roman Francesco Bianchini published the first book on Venus in 1728. He reported that Fontana might have observed a satellite of Venus or some other object. In 1740, James Short-Scotsman observed a small star near Venus. But he was careful to call it a moon of Venus. However, Joseph J. Lalande (French) while compiling an encyclopaedia gave an account of Venus and interpreted Short's observation as one of the best to establish the existence of Venus' moon. In 1759, the German Andreas Meyer – a professor of mathematics, physics and astronomy – also observed a moon of Venus. It is also indicated that some scientists were of the opinion that 'God has created moons to bring light to the planets so that their inhabitants could praise and admire the power and goodness of the creator' (p. 25). In 1854 the well-known physicist, David Brewster described the moons as domestic lamps, which light the primary planets in the absence of the sun.

In the chapter 'From climax to anticlimax', we see that until 1760 eight observations related to the supposed moon of Venus were reported. The first transition of Venus was observed in 1639. Johannes Kepler predicted the next transition in 1761. This was going to be a special case, as Edmond Halley had shown that the passage of Venus could be used to measure the distance of the earth from the sun. The transition of 1761 was a unique opportunity to confirm the hypothesis. During the transit of 1761, some astronomers saw the supposed moon. The chapter ends with the following questions: 'Had they seen a satellite of Venus? If not, what had they seen?'. Such questions at the end of the chapters leave the readers guessing.

As the title 'Contemporary analysis and criticism' suggests, the author discusses the pros and cons of the issue. To start with he shows that at that time there was no theory to approve or disapprove existence of the supposed moon. On the experimental side, some astronomers observed the moon. J. J. Mairan and Lalande from France defended the moon. They argued that under certain conditions the solar atmosphere makes it impossible to observe the moon all times. The mathematician Johann Heinrich Lambert calculated the motion of the satellite and showed that it was impossible to observe the moon during the transition of either 1761 or 1769. However, astrophysicist Maximilian Hell (Vienna) and Roger Boscovich (Croatia) showed that what Cassini and Short saw were optical illusions in the telescopes. In 'A spurious but persistent satellite', we learn that in the 1780s it was generally accepted that Venus had no moon. However, interest in the subject did not vanish. William Herschel studied Venus thoroughly and suggested that the planet had a dense atmosphere to shield the inhabitants from the extreme heat of the sun. In spite of criticism, many were not completely convinced. For instance, in France the famous physicist and astronomer Francois Arago wrote that the 'moon of Venus belongs to the domain of the possible' (p. 102).

The revival of Venus' moon is discussed in 'Closure: the discussion of the 1880s'. It is suggested that probably this was due to the transit of Venus in 1874 and 1882, and more importantly, the discovery of the two unexpected satellites of Mars by the American astronomer Asaph Hall in 1877. It forced the scientists to rethink about Venus. In this chapter we also see that apart from astronomers, artists, mathematicians, poets and writers also considered the issue. However, the later astronomers found it difficult to be-